TREK

GETTING STARTED GUIDE

November 2012

Approved for Public Release; Distribution is Unlimited.

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1 Welcome

Welcome to the Telescience Resource Kit (TReK). The Getting Started Guide will introduce you to the TReK software, documentation, and example programs that make up a TReK Release.

2 Overview

Each TReK software release is comprised of software, documentation, and a set of example programs. This section provides an overview of each component that makes up the TReK product.

2.1 Software

The TReK software includes many applications, dynamic link libraries (DLLs), and other supporting files. You really only need to know about a few of these applications and DLLs in order to understand TReK. The TReK software can be categorized into telemetry software, commanding software, and command management software.

2.1.1 Telemetry Software

Figure 1 shows a high level view of the TReK telemetry software.

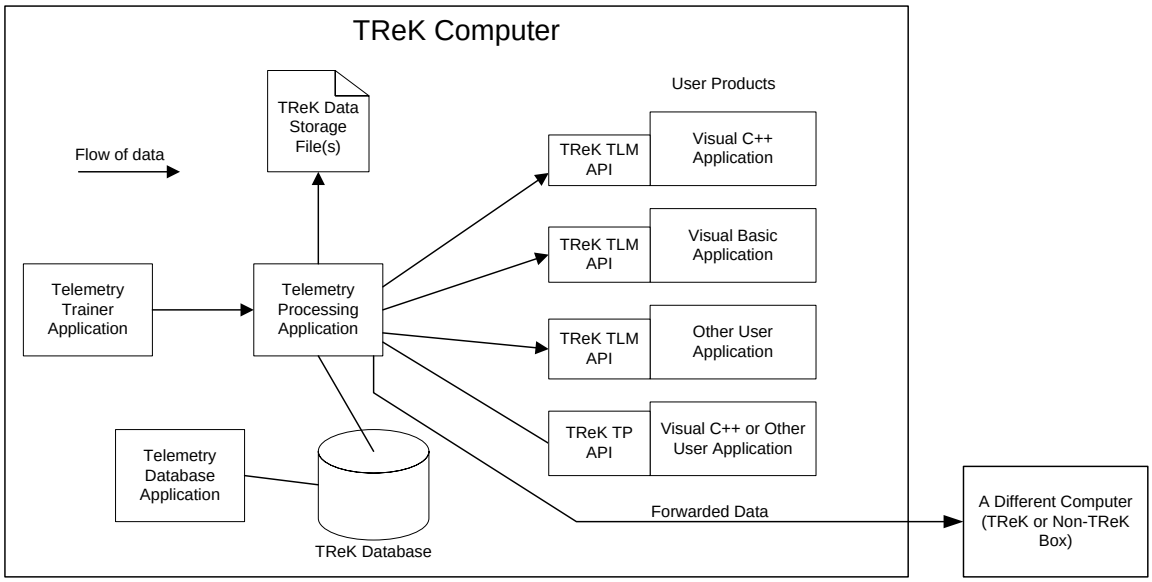

Figure 1 Telemetry Software Overview

There are three telemetry applications. The Telemetry Trainer application generates packets for the TReK system to process. These packets simulate data from the Payload

Data Services System (PDSS) and the Enhanced Huntsville Operations Support Center System (EHS).

You use the Telemetry Processing application to configure your TReK system to receive and process these packets. You can optionally save the packets you receive to data files that can be played back at a later time. And you can also forward data received to other computer systems.

You can use the Telemetry Database application to view and modify the contents of a TReK telemetry database. The TReK telemetry database contains all of the information needed by the TReK system to process the packet.

The TReK Telemetry Application Programming Interface (API) allows you to get the telemetry data processed by TReK into software programs that you build. See the TReK Telemetry Tutorial (TREK-USER-002) for more information on telemetry as it relates to TReK.

The TReK Telemetry Processing (TP) Application Programming Interface (API) provides a way to programmatically control telemetry processing functions from within a software program that you build. All the functions in the TReK Telemetry Processing API are available through the Telemetry Processing application's user interface.

2.1.2 Command Software

Figure 2 shows a high level view of the TReK command software.

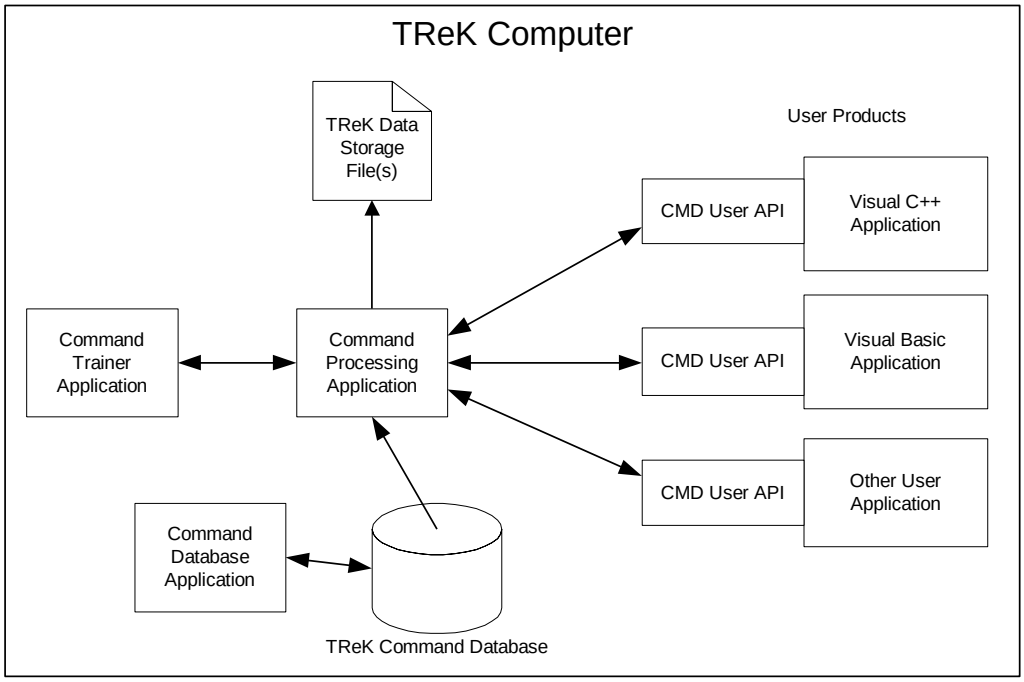

Figure 2 Command Software Overview

As shown in Figure 2, the command software is comprised of three main applications and one user library. Each is described below.

The Command Trainer application simulates the POIC command interface.

The Command Processing application provides the capability to monitor and control all command processing activity on your TReK system. This includes the capability to uplink commands, update commands, receive and process command responses, and display status and configuration information about each command destination.

The Command Database application is used to view and modify the contents of the TReK command database. The command database contains all of the information needed by your TReK system to update, build, and uplink commands.

The Command (CMD) User Application Programming Interface (API) library provides a way to perform commanding functions from within the user products that you build.

2.1.3 Command Management Software

In addition to the command capabilities discussed above, TReK also provides a command management capability. This capability provides a way to manage a multi-platform command environment that can include geographically distributed computers. It is intended to help those teams that need to manage a shared on-board resource such as a facility class payload. This capability provides a way for one individual to manage all the command activities associated with a payload that can be commanded by multiple individuals or groups.

Figure 3 shows a picture of two computers each hosting TReK software. The computer labeled as the Command Node is configured to accept remote connections from other TReK computers. The computer labeled as a Subnode is connected to the Command Node. In this configuration the Subnode can send a command to the Command Node where its contents can be evaluated. The command node can determine whether to allow the command to go through, or block the command from proceeding to its final destination. The important thing to note at this point is that there are two software applications that are used to support this capability: Command Processing and Remote Services. The Command Processing application was discussed above. It is the primary application used to perform command functions. The Remote Services application is used to configure TReK to accept remote connections from external TReK systems. Using this application you can configure security settings, create user accounts, and track remote connections.

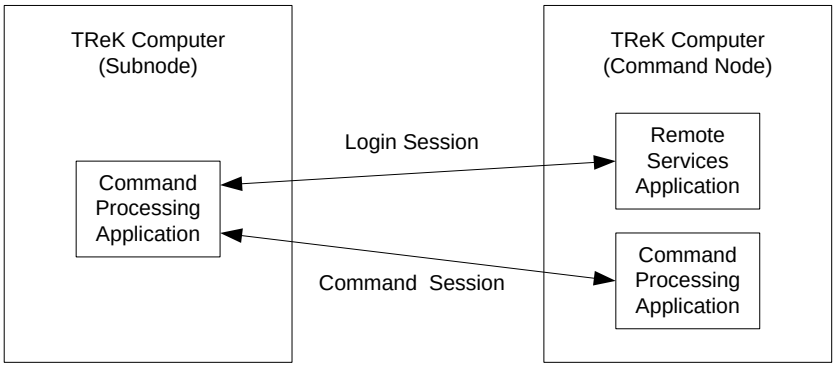

Figure 3 Command Management Software

The Command Management capability is not needed by everyone. If you don't have a need for this capability you can bypass the documentation and tutorials related to this feature. It is not necessary to know how to use this capability to take advantage of all the other telemetry and command capabilities offered by TReK.

2.1.4 Command Bridge Software

The Command Bridge application provides the ability to capture a command sent on a network and forward it to any TReK command destination. This application was originally developed for internal use at MSFC in support of Payload Operations Integration Center (POIC) cadre training. However, since this capability can also be beneficial in a payload test environment, the Command Bridge application has been added to the TReK installation to provide expanded capabilities for all users.

The Command Bridge works by 'bridging' between TReK Telemetry Processing and TReK Command Processing. Figure 4 shows an example data flow. In this example, the Ground Support Equipment (GSE) computer software generates a command and sends it out on the network. The TReK Telemetry Processing application has been configured by the TReK Command Bridge application to receive the incoming command data. The Command Bridge application retrieves the 'telemetry' using the TReK User API, and then passes it to a destination in the Command Processing application using the TReK Command User API.

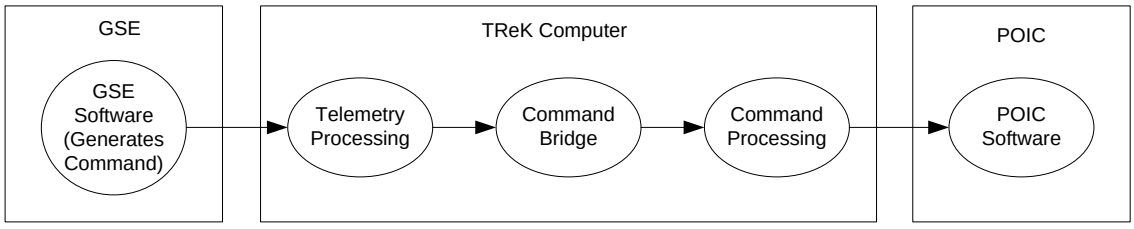

Figure 4 Command Bridge Software

This scenario shows one of the ways the Command Bridge can be used if you have non-TReK software that generates flight commands for your payload. The Command Bridge allows a means of getting that data to the POIC without having to rewrite the code using TReK API calls.

The Command Bridge capability is not needed by everyone. If you don't have a need for this capability you can bypass the documentation and tutorials related to this feature. It is not necessary to know how to use this capability to take advantage of all the other telemetry and command capabilities offered by TReK.

2.2 Documentation

The TReK documentation set is comprised of user guides, tutorials, and reference documents. It can be categorized into telemetry documents and command documents. Although you can start with either set of documents, we recommend starting with the telemetry documents. Each is described in the following sections.

2.2.1 Telemetry Documents

Figure 5 shows the telemetry documents and indicates the order in which the documents should be read.

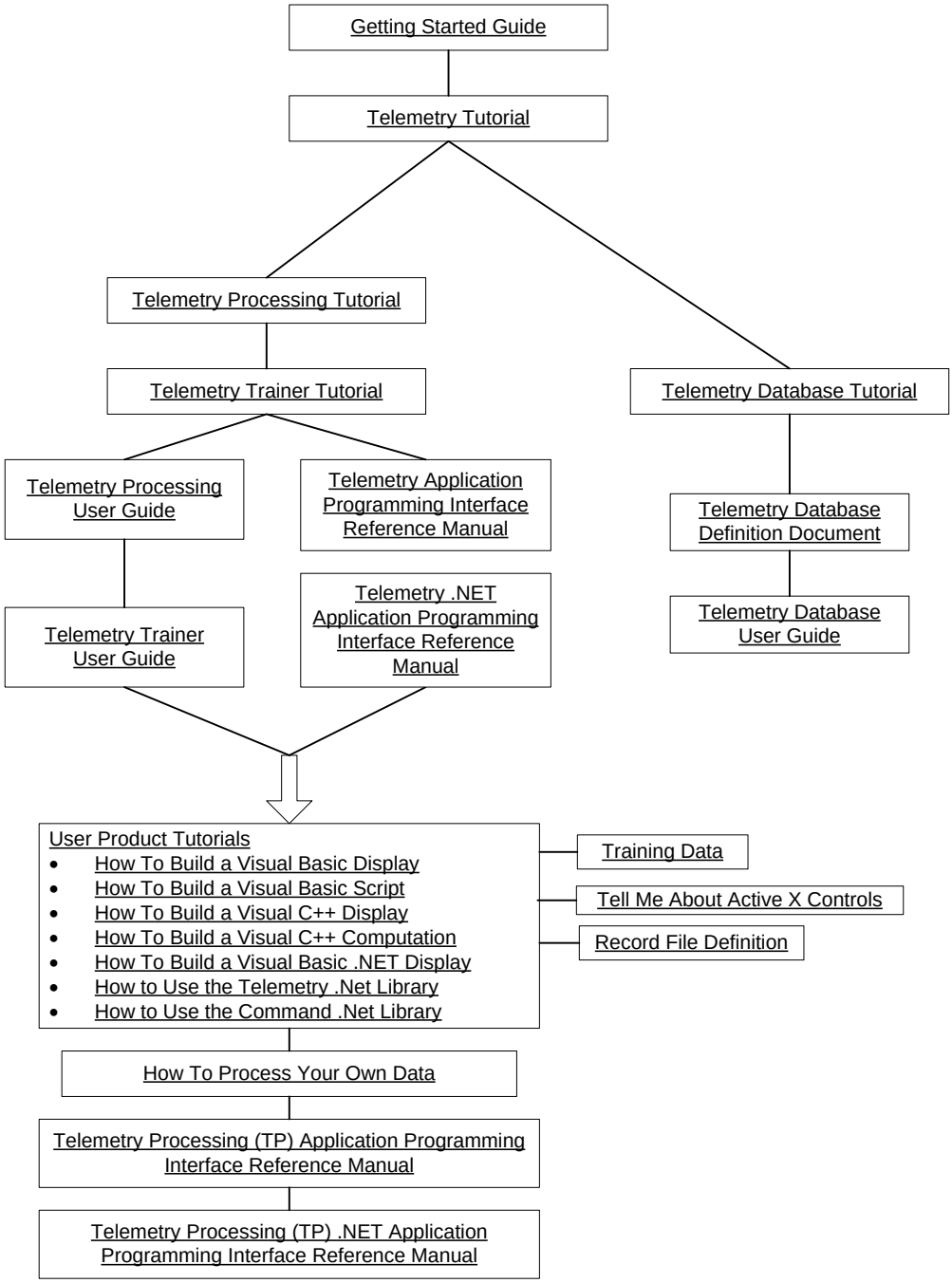

Figure 5 Telemetry Documents

As indicated in Figure 5, the Getting Started Guide should be read first. This document should be followed by the Telemetry Tutorial. These two documents contain very important information about the TReK system and therefore should be read before any of the other documents. After you have read these two documents you have several choices. If you are interested in learning how to use the main features provided by the Telemetry Processing and Telemetry Trainer applications you should work through the left side of

the tree. If you are interested in learning about the Telemetry Database you should work through the right side of the tree.

The Left Side of the Tree

If you work through the left side of the tree, you should read the Telemetry Processing and Telemetry Trainer Tutorials first. These tutorials provide step-by-step instructions that demonstrate how to use the main features in each application. Once you have worked through these tutorials you have two choices. You can learn more about these applications by reading the corresponding user guide, or you can start learning about the TReK Telemetry Application Programming Interface (API). Please note that the user guides contain details about each application menu, dialog box, and message. Therefore they are best used as reference material (vs. a book that you would read cover to cover). If you plan to build user products (such as displays, computations, and scripts) you should read sections one through ten in the Telemetry Application Programming Interface Reference Manual. The Telemetry Application Programming Interface Reference Manual is, as its name implies, a reference manual and not a user guide. It contains several sections that introduce important concepts about the TReK Telemetry API. The Telemetry .NET Application Programming Interface Reference Manual provides details about the .NET version of the Telemetry API Library. After reading these documents you can move on to the User Product Tutorials. These tutorials can be read in any order. The How to Process Your Own Data tutorial should be read last since it is an advanced tutorial. The Training Data document is a reference document that contains information that can be used when you start building your own user products. The Tell Me About Active X Controls document discusses Active X controls and how they relate to TReK. The Record File Definition discusses the directory/file naming conventions and record file formats for TReK. The TReK Telemetry Processing (TP) Application Programming Interface Reference Manual is something you may never need to use. The Telemetry Processing API provides a way to programmatically control telemetry processing functions. All the functions in the Telemetry Processing API are available through the Telemetry Processing application's user interface. Therefore, unless you have a need to perform these functions programmatically, you may never have a need to use this API or the corresponding reference manual.

The Right Side of the Tree

If you're interested in learning about the telemetry database, you should read the documents on the right side of the tree. The Telemetry Database Tutorial should be read first. This tutorial provides step-by-step instructions that demonstrate the main features of the Telemetry Database application. The Telemetry Database User Guide and the Telemetry Database Definition Document are closely related and should be read together.

White Paper (Not Shown In Tree)

In addition to the documents described above, there is a white paper entitled "TReK Processing Types". Since this paper covers an advanced topic, it is best to read this after you become familiar with the fundamental concepts described in the Telemetry Tutorial, Telemetry Processing Tutorial, Telemetry Trainer Tutorial, and the API Reference Manual.

A second white paper entitled "TReK How to Manually Uninstall the TReK Software" describes the steps necessary to manually uninstall TReK if the Add/Remove Programs option does not work. The need to manually uninstall the software is very rare and is usually associated with a major operating system upgrade.

Document Organization

All TReK documents (except the Getting Started Guide) contain a "What You Need To Know Before Reading This Document" section. Please make sure you meet the requirements noted in the "What You Need To Know Before Reading This Document" section before reading the document.

All of the TReK User Guides (Telemetry Processing User Guide, the Telemetry Trainer User Guide, Telemetry Database User Guide, etc.) are organized in a similar manner. They each contain an introduction section, a main window section, and several other sections that provide details about each menu, dialog box, and message in the application. In some cases there is also a special topics section that discusses special topics associated with the application

A summary of each TReK document is provided below.

- Getting Started Guide (TREK-USER-001)

The Getting Started Guide should be read first. It contains an overview of the TReK software, TReK documentation, and the TReK installation directory. It also includes a step-by-step tutorial that introduces you to the TReK software.

- Telemetry Tutorial (TREK-USER-002)

The Telemetry Tutorial should be read after you read the Getting Started Guide. The Telemetry Tutorial provides an overview of telemetry processing and explains key concepts that you need to understand in order to use your TReK system. Many important terms and concepts are introduced in this document making it a must for all users.

- Telemetry Processing User Guide (TREK-USER-003)

The Telemetry Processing User Guide provides an overview of the Telemetry Processing application. It contains information about the application menus, dialog boxes, and messages.

- Telemetry Trainer User Guide (TREK-USER-004)

The Telemetry Trainer User Guide provides an overview of the Telemetry Trainer application. It contains information about the application menus, dialog boxes, and messages.

- Telemetry Database User Guide (TREK-USER-005)

The Telemetry Database User Guide provides an overview of the Telemetry Database application. It contains information about the application menus, forms, and messages.

- How To Build A Visual Basic Display Tutorial (TREK-USER-006)

This tutorial demonstrates how to build a display using the Visual Basic COTS product and the TReK Application Programming Interface.

- How To Build A Visual C++ Display Tutorial (TREK-USER-007)

This tutorial demonstrates how to build a display using the Visual C++ COTS product and the TReK Application Programming Interface.

- How To Build A Visual Basic Script Tutorial (TREK-USER-008)

This tutorial demonstrates how to build a script using the Visual Basic COTS product and the TReK Application Programming Interface.

- How To Build A Visual C++ Computation Tutorial (TREK-USER-009)

This tutorial demonstrates how to build a computation using the Visual C++ COTS product and the TReK Application Programming Interface.

- How To Process Your Own Data Tutorial (TREK-USER-010)

This tutorial demonstrates how to use the TReK Application Programming Interface to retrieve raw data that can then be processed in various ways. Please note that this tutorial does not teach you how to process data. It teaches you how to retrieve your raw data so you can pass it to your own software for further processing (such as decommutation, conversion, etc).

- Telemetry Database Definition Document (TREK-USER-011)

The Telemetry Database Definition Document is a reference document that contains detailed information about the TReK Telemetry Database.

- Telemetry Application Programming Interface Reference Manual (TREK-USER-028)

The Telemetry Application Programming Interface Reference Manual is a reference document that contains detailed information about the TReK Telemetry Application Programming Interface.

- Telemetry .NET Application Programming Interface Reference Manual (TREK-USER-047)

The Telemetry .NET Application Programming Interface Reference Manual is a reference document that contains detailed information about the .NET version of the TReK Telemetry Application Programming Interface.

- Telemetry Processing .NET Application Programming Interface Reference Manual (TREK-USER-047)

The Telemetry Processing .NET Application Programming Interface Reference Manual is a reference document that contains detailed information about the .NET version of the TReK Telemetry Processing Application Programming Interface.

- Training Data (TREK-USER-012)

The Training Data document contains information about the packets generated by the TReK Telemetry Trainer application. This information will be useful to you when you begin building your own user products.

- Tell Me About Active X Controls (TREK-USER-013)

The Tell Me About Active X Controls document provides an introduction to Active X controls and explains how they relate to TReK.

- TReK Processing Types White Paper (TREK-USER-016)

The TReK Processing Types White Paper describes the different ways that a TReK system can be configured to process telemetry data. Since this paper covers an advanced topic, it is best to read this after you become familiar with the fundamental concepts described in the Telemetry Tutorial, the User Guides, and the API Reference Manual.

- TReK Telemetry Processing Tutorial (TREK-USER-017)

The TReK Telemetry Processing Tutorial introduces you to the main features provided by the Telemetry Processing application. For example, this tutorial will teach you how to configure TReK to receive telemetry data, process telemetry data, record telemetry data, and forward telemetry data.

- TReK Telemetry Trainer Tutorial (TREK-USER-018)

The TReK Telemetry Trainer Tutorial introduces you to the main features provided by the Telemetry Trainer application. For example, this tutorial will teach you how to configure TReK to generate and send telemetry data.

- TReK Telemetry Database Tutorial (TREK-USER-019)

The TReK Telemetry Database Tutorial introduces you to the main features provided by the Telemetry Database application. For example, this tutorial will teach you how to perform a database query, how to generate a database report, and how to insert new data into the database.

- TReK Record File Format Definition Document (TREK-USER-031)

The TReK Record File Format Definition Document describes the format of all recorded data for this release and all previous releases. It also covers directory and file naming conventions.

- TReK How To Build A Visual Basic .NET Display Tutorial (TREK-USER-033)

This tutorial demonstrates how to build a display using the Visual Basic .NET COTS product and the TReK Application Programming Interface.

- TReK Telemetry Processing Application Programming Interface Reference Manual (TREK-USER-039)

This document is a reference document that contains detailed information about the TReK Telemetry Processing Application Programming Interface.

- TReK How to Manually Uninstall the TReK Software (TREK-USER-040)

This document provides step-by-step instructions manually uninstalling the TReK software when the preferred method (Add/Remove Programs from the Control Panel) option does not work.

- TReK How to Use the Telemetry .NET Library Tutorial (TREK-USER-045)

This tutorial demonstrates how to use the .NET version of the TReK Telemetry User API Library. It provides step-by-step instructions for building a computation using C# and the TReK Telemetry .NET Library.

2.2.2 Command Documents

Figure 6 shows the command documents and indicates the order in which the documents should be read.

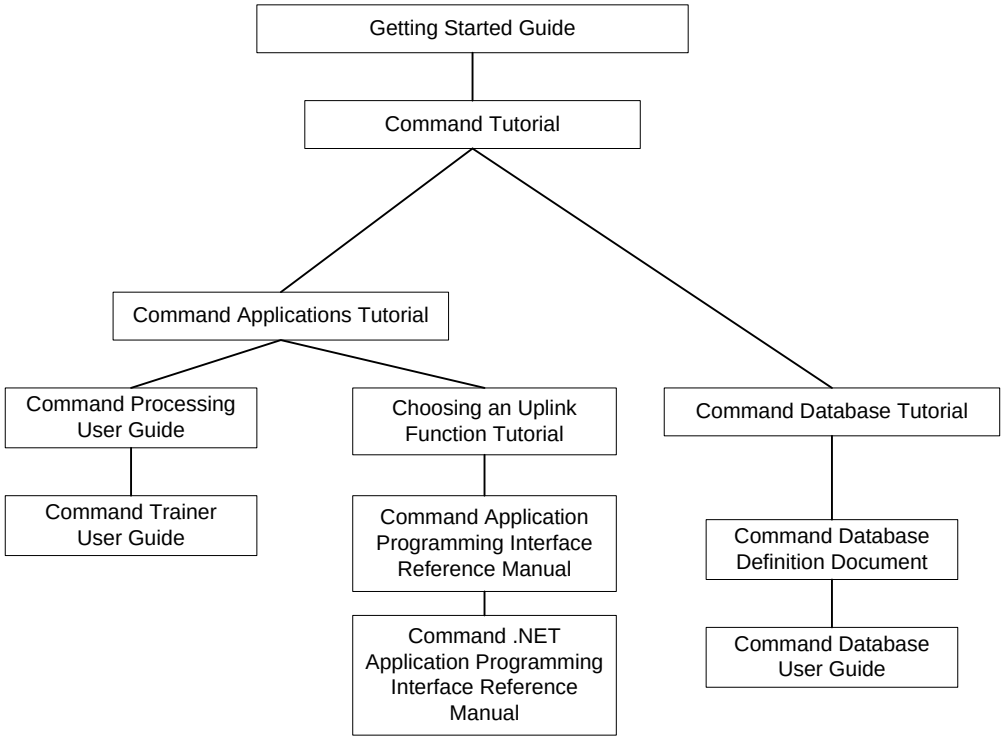

Figure 6 Command Documents

As indicated in Figure 6, the Getting Started Guide should be read first. This document should be followed by the Command Tutorial. These two documents contain very important information about TReK commanding and therefore should be read before any of the other documents. If you have already read the Getting Started Guide, because you

started with the telemetry documents, then you should start with the Command Tutorial. After you have read the Getting Started Guide and the Command Tutorial documents you have several choices. If you are interested in learning how to use the main features provided by the Command Processing and Command Trainer applications you should work through the left side of the tree. If you are interested in learning about the Command Database you should work through the right side of the tree.

The Left Side of the Tree

If you work through the left side of the tree, you should read the Command Applications Tutorial first. This tutorial provides step-by-step instructions that demonstrate how to use the main features in the Command Trainer and Command Processing applications. Once you have worked through this tutorial you have two choices. You can learn more about these applications by reading the corresponding user guide, or you can start learning about the TReK Command User Application Programming Interface (API). Please note that the user guides contain details about each application menu and dialog box. Therefore they are best used as reference material (vs. a book that you would read cover to cover). If you plan to build user products you should read sections one through ten in the Command Application Programming Interface Reference Manual. The Command Application Programming Interface Reference Manual is, as its name implies, a reference manual and not a user guide. It contains several sections that introduce important concepts about the TReK Command API. The Command .NET Application Programming Interface Reference Manual provides details about the .NET version of the Command User API Library.

The Right Side of the Tree

If you're interested in learning about the command database, you should read the documents on the right side of the tree. The Command Database Tutorial should be read first. This tutorial provides step-by-step instructions that demonstrate the main features of the Command Database application. The Command Database User Guide and the Command Database Definition Document are closely related and should be read together. These two documents are best used as reference material (vs. a book that you would read cover to cover).

Document Organization

All TReK documents (except this document) contain a "What You Need To Know Before Reading This Document" section. Please make sure you meet the requirements noted in the "What You Need To Know Before Reading This Document" section before reading the document.

All of the TReK User Guides (Command Processing User Guide, the Command Trainer User Guide, Command Database User Guide, etc.) are organized in a similar manner. They each contain an introduction section, a main window section, and several other sections that provide details about each menu and dialog box in the application. In some cases there is also a special topics section that discusses special topics associated with the application

A summary of each TReK document is provided below.

- Getting Started Guide (TREK-USER-001)

The Getting Started Guide should be read first. It contains an overview of the TReK software, documentation, and installation directory. It also includes a step-by-step tutorial that introduces you to the TReK software.

- Command Tutorial (TREK-USER-020)

The Command Tutorial should be read after you read the Getting Started document. The Command Tutorial provides an overview of command processing and explains key concepts that you need to understand in order to use the TReK commanding software. Many important terms and concepts are introduced in this document making it a must for all users.

- Command Processing User Guide (TREK-USER-023)

The Command Processing User Guide provides an overview of the Command Processing application. It contains information about the application menus and dialog boxes.

- Command Trainer User Guide (TREK-USER-022)

The Command Trainer User Guide provides an overview of the Command Trainer application. It contains information about the application menus and dialog boxes.

- Command Database User Guide (TREK-USER-024)

The Command Database User Guide provides an overview of the Command Database application. It contains information about the application menus and forms.

- Command Database Definition Document (TREK-USER-015)

The Command Database Definition Document is a reference document that contains detailed information about the TReK Command Database.

- Command Application Programming Interface Reference Manual (TREK-USER-028)

The Command Application Programming Interface Reference Manual is a reference document that contains detailed information about the command functions in the TReK Application Programming Interface.

- Command .NET Application Programming Interface Reference Manual (TREK-USER-048)

The Command .NET Application Programming Interface Reference Manual is a reference document that contains detailed information about the .NET version of the TReK Command Application Programming Interface.

- TReK Command Applications Tutorial (TREK-USER-021)

The TReK Command Applications Tutorial introduces you to the main features provided by the Command Trainer and Command Processing applications. For example, this

tutorial will teach you how to establish a command destination that can be used to update commands, uplink commands, and receive and process command responses.

- TReK Command Database Tutorial (TREK-USER-025)

The TReK Command Database Tutorial introduces you to the main features provided by the Command Database application. For example, this tutorial will teach you how to perform a database query, how to generate a database report, and how to insert new data into the database.

- TReK Choosing an Uplink Function Tutorial (TREK-USER-032)

The TReK Choosing an Uplink Function Tutorial provides information that helps in determining which of the TReK Command API functions to use.

- TReK How to Use the Command .NET Library Tutorial (TREK-USER-046)

This tutorial demonstrates how to use the .NET version of the TReK Command User API Library. It provides step-by-step instructions for building a command example program using C# and the TReK Command .NET Library.

2.2.3 Command Management Documents

The Command Management capability is discussed in several documents. Before reading any of these documents you need to read the command documents described in the previous section. It is very important that you have a solid understanding of TReK commanding before approaching command management. Figure 7 shows the command management documents and indicates the order in which the documents should be read.

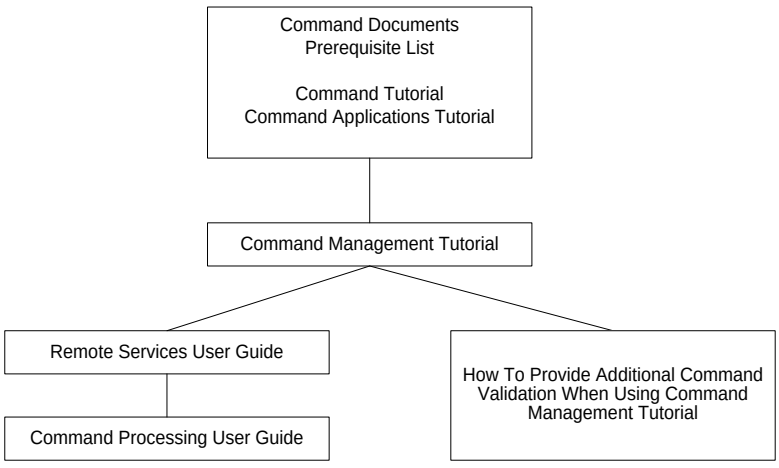

Figure 7 Command Management Documents

As indicated in Figure 7, the Command Tutorial and Command Applications Tutorial are prerequisites for the Command Management documents. The first Command Management document you should read is the Command Management Tutorial. After

that you can either reference the Remote Services and Command Processing User Guides for more details, or you can read the How To Provide Additional Command Validation When Using Command Management tutorial.

A summary of each TReK document is provided below.

- Command Management Tutorial (TREK-USER-036)

The Command Management Tutorial will introduce you to the Command Management concept. It provides an overview of the terminology, concepts, and software that make up the command management capability.

- Remote Services User Guide (TREK-USER-037)

The Remote Services User Guide provides an overview of the Remote Services application. It contains information about the application menus and dialog boxes.

- Command Processing User Guide (TREK-USER-023)

The Command Processing User Guide provides an overview of the Command Processing application. It contains information about the application menus and dialog boxes.

- How To Provide Additional Command Validation When Using Command Management Tutorial (TREK-USER-038)

The How to Provide Additional Command Validation When Using Command Management Tutorial demonstrates how to configure TReK to interact with user-provided command validation software when using the Command Management capability.

2.2.4 Command Bridge Documents

The Command Bridge capability is covered in the Command Bridge User Guide and the Command Bridge Tutorial. Before reading either of these documents you need to read the telemetry and command documents listed in Figure 8. It is important that you have an understanding of TReK telemetry and commanding before using the command bridge. Figure 7 shows the command bridge documents and indicates the order in which the documents should be read.

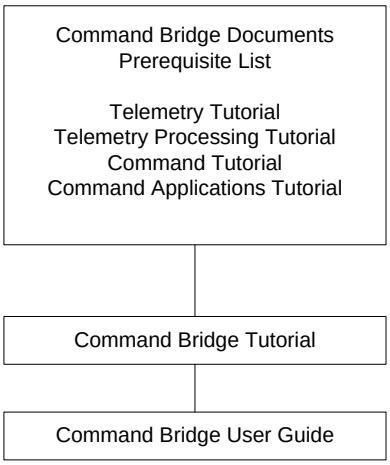

Figure 8 Command Bridge Documents

A summary of each TReK document is provided below.

- Command Bridge Tutorial (TREK-USER-043)

The Command Bridge Tutorial will introduce you to the Command Bridge concept. It provides an overview of the terminology, concepts, and software that make up the command bridge capability.

- Command Bridge User Guide (TREK-USER-042)

The Command Bridge User Guide provides an overview of the Command Bridge application. It contains information about the application menus and dialog boxes.

3 Directory Structure

When you install TReK on your computer, a directory structure is created for the TReK software. The first time each user starts one of the TReK applications; directories are created for that user. This section describes the different directories that make up the TReK directory structure and briefly describes the files that are in each directory.

3.1 TReK Installation Directories

The directories in the TReK installation directory contain the files that are needed by every TReK user.

3.1.1 The bin Directory

The bin directory contains all of the executables, application DLLs, and help files for the TReK software. This directory contains the applications that are found on the TReK start menu and other executables that are needed by these applications. You will never need to use this directory; all of the options you need are available on the start menu.

3.1.2 The database Directory

The database directory contains a telemetry database and a command database that can be used for training purposes. These database files are copied into the user directory for each user.

3.1.3 The db_template_files Directory

The db_template_files directory contains data files used by the Telemetry Database application and the Command Database application for creating databases and adding headers.

3.1.4 The documentation Directory

The Documentation directory contains four subdirectories. You can open all of the TReK documents from the Start menu.

The Reference Documents Directory
The Reference Documents directory contains reference documents such as the Command Database Definition Document (TREK-USER-015) and the TReK Command Application Programming Interface Reference Document (TREK-USER-028).

The Tutorials Directory
The Tutorials directory contains all of the tutorial documents for TReK.

The User Guides Directory
The User Guides directory contains all of the user guides for TReK software. The TReK Getting Started Guide is found in this directory.

The White Papers Directory
The White Papers directory contains all of the white papers for TReK software.

3.1.5 The examples Directory

The examples directory contains a subdirectory for each TReK COTS product. Some of the examples have corresponding documents that are denoted in parentheses.

Note: The file privileges in Vista are more restrictive than previous versions of Windows. The example files located in the TReK installation directory can be moved to a user directory for editing or compiling.

The Visual Basic Directory
The Visual Basic directory has several subdirectories containing the executables and Visual Basic project files delivered as examples for TReK. The Visual Basic directory contains the subdirectories shown below.

- Executables – this directory contains all of the executables for Visual Basic projects.

- VBDisplay (How to Build a Visual Basic Display)
- VBDisplayVariety
- VBPseudo
- VBScript (How to Build a Visual Basic Script)
- VBCommandAPIExample

The Visual Basic .NET Directory
The Visual Basic .NET directory has a single subdirectory containing a Visual Basic .NET example. This example requires Visual Studio .NET.

- VBNETDisplay (How to Build a Visual Basic .NET Display)

The Visual C++ Directory
The Visual C++ directory has several subdirectories containing the executables and Visual C++ project files delivered as examples for TReK. The Visual C++ directory contains the subdirectories shown below. For more information on the contents of the Visual C++ project files see Section 2.2.

- Executables - this directory contains all of the executables for the Visual C++ projects.
- Computation (How to Build a Visual C++ Computation)
- Cyclic (How to Build a Visual C++ Display)
- CyclicTwo
- GenericDisplay
- GSEDisplay
- MultipleSamples
- PacketArrivalComputation
- UDSM Display
- UserComp (How to Process Your Own Data)
- ValueDisplay
- CommandValidation (How To Provide Additional Command Validation When Using Command Management)

The Visual C# .NET Directory
The Visual C# .NET directory has two subdirectories containing Visual C# .NET examples. These examples require Microsoft Visual Studio 2005 or greater.

- Computation (How to Use the Telemetry .NET Library)
- CommandExample (How to Use the Command .NET Library)

3.1.6 The gen_files Directory

The gen_files directory contains text files used by the Telemetry Trainer to generate packets of data. Editing these files can cause unexpected results.

3.1.7 The include Directory

The include directory contains the include files you need to use the TReK API libraries.

3.1.8 The lib Directory

The lib directory contains library and dll files you will need when using the TReK API.

Library	Description
trek_user_api.lib	The TReK Telemetry API Library. This library has an ANSI C interface.
trek_cmd_user_api.lib	The TReK Command API Library. This library has an ANSI C interface.
trek_user_api.bas	The TReK Telemetry API Library for use with Visual Basic. Originally developed for Visual Basic 6.
trek_user_api.vb	The TReK Telemetry API Library for use with Visual Basic.NET. This was the first TReK library delivered for compatibility with .NET. If you are starting a new .NET application we recommend using one of the dotnet libraries listed below.
trek_cmd_user_api.bas	The TReK Command API Library for use with Visual Basic. Originally developed for Visual Basic 6.
trek_cmd_user_api.vb	The TReK Command API Library for use with Visual Basic.NET. This was the first TReK library delivered for compatibility with .NET. If you are starting a new .NET application we recommend using one of the dotnet libraries listed below.
trek_tp_user_api.lib	The TReK Telemetry Processing API Library. This library has an ANSI C interface.
trek_telemetry_dotnet_api.dll	The .NET version of the TReK Telemetry API and TReK Telemetry Processing API. The library is compatible with all .NET languages (C#, VB, C++, etc.)
trek_command_dotnet_api.dll	The .NET version of the TReK Command API. Compatible with all .NET languages (C#, VB, C++, etc.)

Table 1 TReK lib Directory Contents Description

3.1.9 The sim_files Directory

The sim_files directory contains text files used by the Command Trainer to simulate POIC and ERIS data.

3.1.10 The templates Directory

The templates directory contains files that are referenced in several of the TReK Tutorials. These files can be used to add functionality to your user products.

3.2 User Directories

The user directories are created for each user and allow user specific data to be separate. The user directories are installed under the Application Data folder for the user account. The location of this folder is different based on the operating system. If the operating system is installed in the default directory on the C drive then for Windows XP, the TReK folder most likely will be:

C:\Documents and Settings\<username>\Application Data\TReK

for Windows 7 the TReK folder most likely will be:

C:\Users\<username>\AppData\Roaming\TReK

Please note that it is possible for the user directories to be on another partition. If you do not see the directory on the C drive, look for the same name on another drive.

3.2.1 The command_database Directory

The command_database directory is the default directory when using TReK command databases. The training command database shipped with TReK is copied into this directory the first time you use the TReK software. You can save your database files to other directories if you wish.

3.2.2 The configuration_files Directory

The configuration_files directory contains the default directories for storing Telemetry Processing, Telemetry Trainer, Command Processing, Command Trainer, and Remote Services configuration files. You may also save these files to other directories on the computer.

3.2.3 The database Directory

The database directory is the default directory when using TReK telemetry databases. The training telemetry database shipped with TReK is copied into this directory the first time you use the TReK software. You can save your database files to other directories if you wish.

3.2.4 The displays Directory

The displays directory is the default directory for storing displays created with the Telemetry Processing application. You can save your display files to other directories if you wish.

3.2.5 The simulation_files Directory

The simulation_files directory contains the default directories for storing POIC and ERIS simulation files. You may also save these files to other directories on the computer.

3.2.6 The tmp Directory

The tmp directory is a directory used by TReK software for creating temporary files.

3.3 Windows system32 Directory

When TReK is installed, three TReK files are placed in the Windows system32 directory: trek_user_api.dll, trek_cmd_user_api.dll, and trek_tp_user_api.dll. These DLLs correspond to the three TReK application programming interface libraries.

4 Technical Support

If you are having trouble installing the TReK software or using any of the TReK software applications, please try the following suggestions:

Read the appropriate material in the manual and/or on-line help.

Ensure that you are correctly following all instructions.

Checkout the TReK Web site at http://trek.msfc.nasa.gov/ for Frequently Asked Questions.

If you are still unable to resolve your difficulty, please contact us for technical assistance:

TReK Help Desk E-Mail, Phone & Fax:

E-Mail:	trek.help@nasa.gov
Telephone:	256-544-3521 (8:00 a.m. - 4:30 p.m. Central Time)
Fax:	256-544-9353

TReK Help Desk hours are 8:00 a.m. – 4:30 p.m. Central Time Monday through Friday. If you call the TReK Help Desk and you get a recording please leave a message and someone will return your call. E-mail is the preferred contact method for help. The e-mail message is automatically forwarded to the TReK developers and helps cut the response time.

5 TReK Applications Tour

This section will introduce you to the TReK software by walking you through some of the most common tasks you will perform with the TReK software applications. The Telemetry Tour introduces you to the Telemetry Processing application and the Telemetry Trainer application. The Telemetry Database Tour introduces you to the Telemetry Database application. The Commanding Tour introduces you to the Command Processing application and the Command Trainer application. The Command Database Tour introduces you to the Command Database application.

5.1 Telemetry Tour

This section will show you how to configure your TReK system to generate data using the Telemetry Trainer application. It will also show you how to configure the Telemetry Processing application so your TReK system will capture and process the data that is generated. Since you're going through this step-by-step tutorial before you've read any of the other TReK documentation, you may not understand everything you see. However, this is a good opportunity to jump in and get a first-hand look at the TReK telemetry software before you start digging into the details.

1. You can start the Telemetry Processing application by using the Window's **Start** menu. Go to the Window's **Start** menu, select **Programs**, select **TReK**, and then select **Telemetry Processing.** (Note: If you selected a Program Folder name other than **TReK** during installation, then that name will appear on the Start menu instead of TReK). The **Telemetry Processing** main window as shown in Figure 9 will appear on your screen.

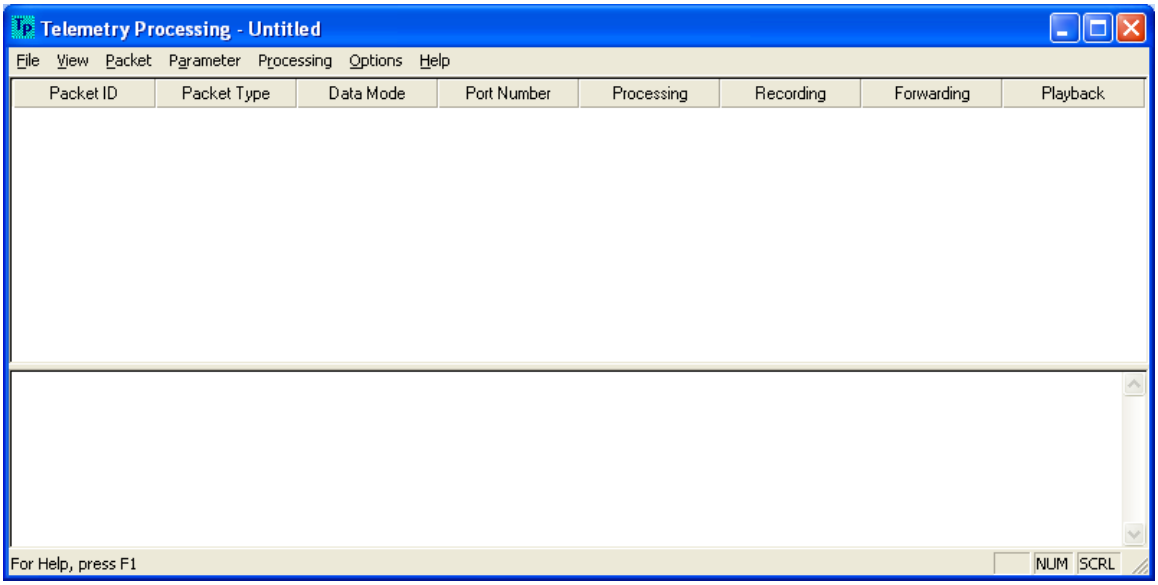

Figure 9 Telemetry Processing Main Window

2. Go to the **Packet** menu and select **Add A Packet**. The Add A Packet dialog as shown in Figure 10 will appear.

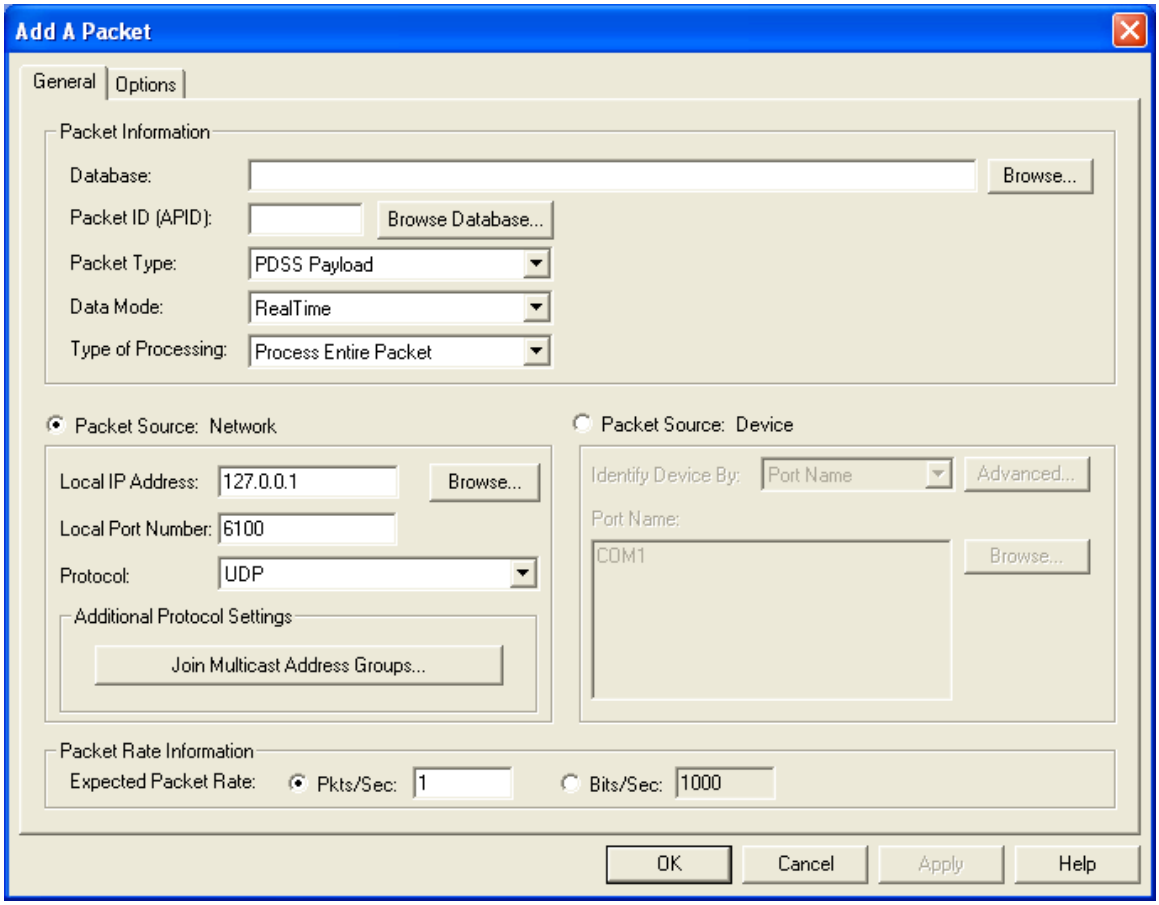

Figure 10 Add A Packet (General Tab) Dialog

3. In the Add A Packet dialog enter the following information:

Database:	<Full Path>\TelemetryDatabase.mdb Hint: Don't forget to enter the full directory path. The Browse button provides a way to select the database and will fill in the full directory path for you.
Packet ID (APID):	7
Packet Type:	PDSS Payload
Data Mode:	RealTime
Type of Processing:	Process Entire Packet
Packet Source:	Network
Local IP Address:	Enter your IP address in the field.

	Hint: This field should have defaulted to your local Unicast IP Address. You can also use the Browse button to select from a list of available IP addresses for your computer.
Local Port Number:	6100
Protocol:	UDP
Expected Packet Rate:	1 (Pkts/Sec)

When you are done entering this information push the **OK** button. You should now see the packet listed in the main window packet list.

4. Select the packet in the main window packet list and then go to the **Packet** menu and select **Activate Packet**. You will see the packet change colors from black to purple and you will see a message in the message area of the main window indicating that the packet is initializing. This means that your TReK system is performing setup tasks so it will be ready to accept the packet when the packet arrives. On slower machines this can take a few seconds so be patient. Once the packet is activated the packet color will change from purple to blue and you will see another message in the message area stating that the packet has been activated. If you were receiving packets at this moment then your packets would be getting processed and the color of the packet would change to green to indicate that data was arriving. If you had a display up that contained any of the parameters in Packet ID 7 you would be able to see the values of those parameters.

At this point you have configured your TReK system to receive Packet ID 7 (APID 7). Now you need to set up the Telemetry Trainer application so it generates Packet ID 7.

5. You can start the Telemetry Trainer application by using the Window's **Start** menu. From the **Start** menu select **Programs**, select **TReK**, and then select **Telemetry Trainer.** (Note: If you selected a Program Folder name other than **TReK** during installation, then that name will appear on the Start menu instead of TReK). The **Telemetry Trainer** main window as shown in Figure 11 will appear on your screen.

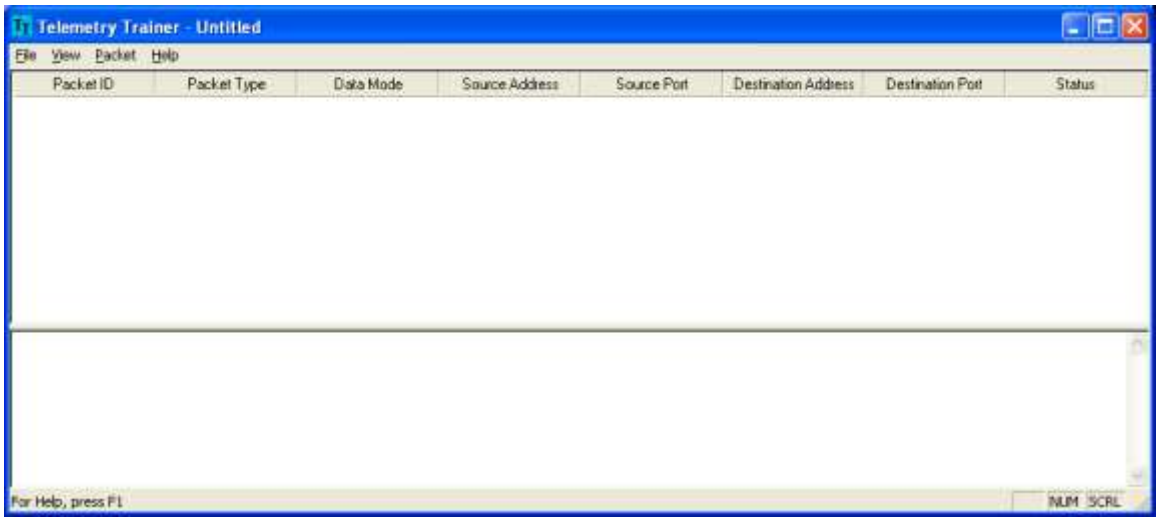

Figure 11 Telemetry Trainer Main Window

6. Go to the **Packet** menu and select **Add A Packet**. The Add A Packet dialog as shown in Figure 12 will appear.

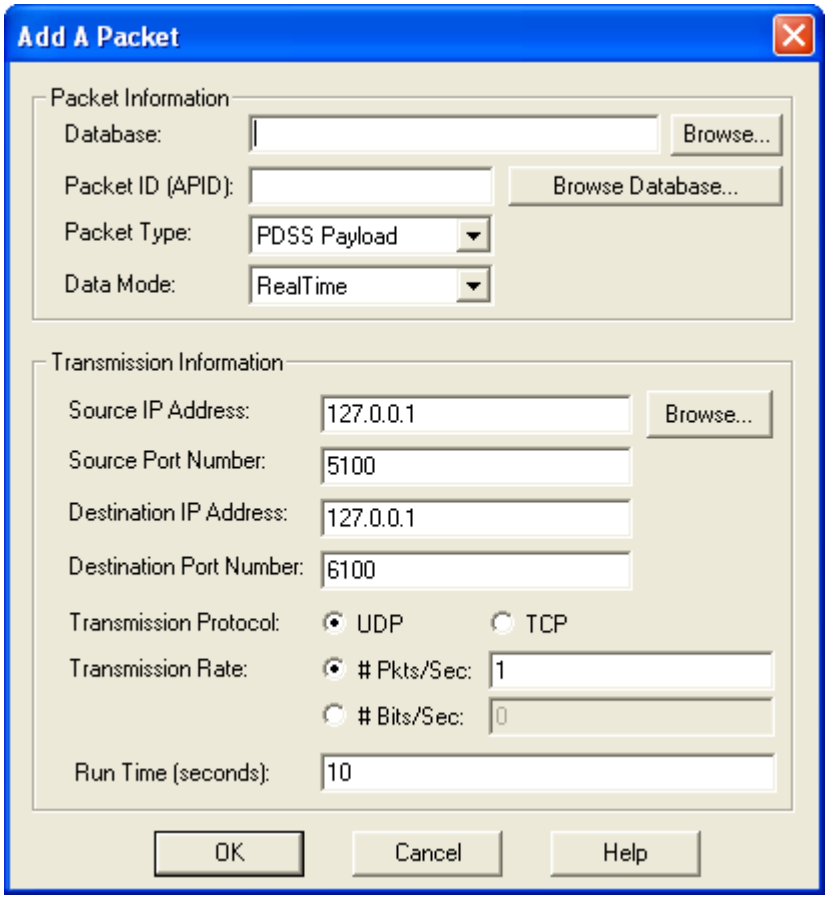

Figure 12 Add A Packet Dialog

7. In the Add A Packet dialog enter the following information:

Database:	<Full Path>\TelemetryDatabase.mdb Hint: Don't forget to enter the full directory path. The Browse button provides a way to select the database and will fill in the full directory path for you.
Packet ID (APID):	7
Packet Type:	PDSS Payload
Data Mode:	RealTime
Source IP Address:	<Your IP Address> Hint: This field should have defaulted to your local IP Address.
Source Port Number:	5100
Destination IP Address:	<Your IP Address> Hint: This field should have defaulted to your local IP Address.
Destination Port Number:	6100
Transmission Protocol:	UDP
Transmission Rate:	# Pkts/sec: 1
Run Time (seconds):	240

When you are done entering this information push the **OK** button. You should now see the packet listed in the Telemetry Trainer main window packet list.

8. Go to the **Packet** menu in the Telemetry Trainer application and select **Send Packet**. You will see the color of the packet change to green and a message in the message area of the main window indicating that the packet is being sent.

At this point you have configured your TReK system to generate and receive Packet ID 7 (APID 7). You can tell that you are sending and receiving data because the color of the packet in the Telemetry Trainer application is green indicating that it is being sent, and the color of the packet in the Telemetry Processing application is green indicating that it is being received. Now you need to bring up a display so you can see some data.

9. Go to the **Start** menu, select **TReK**, select **Examples**, select **Visual C++**, and select **Cyclic Two**. The Cyclic Two display as shown in Figure 13 will appear on your screen.

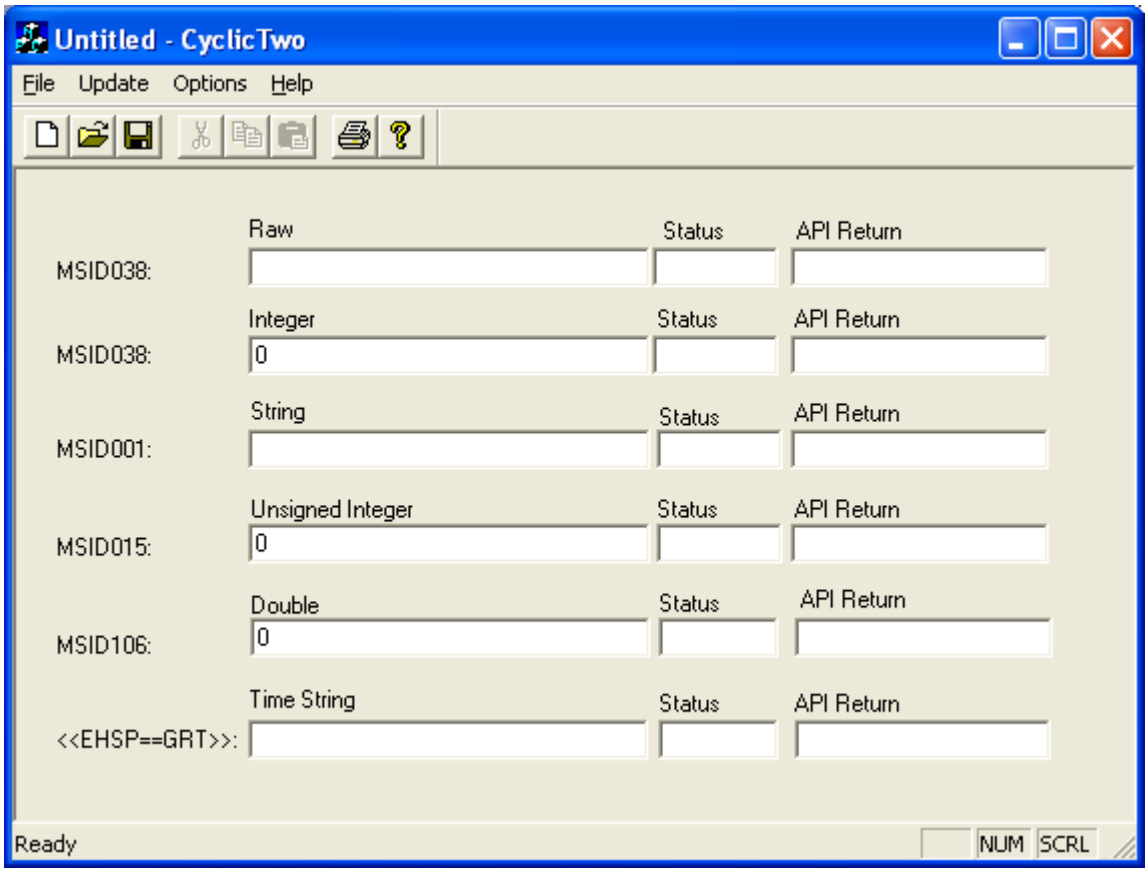

Figure 13 Cyclic Two Display

10. In the Cyclic Two main window, go to the **Update** menu and select **Start**. You should now be seeing the Cyclic Two display updating with new data once every second. If you want to stop the display from updating, go to the Update menu and select Stop.

Hint: If you don't see the data updating, this probably means that the Telemetry Trainer application has stopped sending the packet (the color of the packet will be gold). If this is the case, go to the packet list in the **Telemetry Trainer** main window and select the packet. Then go to the **Packet** menu and select **Send**. This will tell the Telemetry Trainer application to start sending Packet ID 7 for another 240 seconds.

11. In the Cyclic Two main window, go to the **File** menu and select **Exit**.

Note: You should always exit all of your user products (displays, computations, scripts, etc.) before shutting down the Telemetry Processing application. These products interface with the TReK telemetry processing software through the TReK Application Programming Interface and therefore should be shut down before you shut down the Telemetry Processing application.

12. In the Telemetry Trainer main window, go to the **File** menu and select **Exit**. Select No when asked if you want to save the changes.

13. In the Telemetry Processing main window, go to the **File** menu and select **Exit**. Select No when asked if you want to save the changes.

This concludes the Telemetry Tour. The next section will introduce you to the Telemetry Database application.

5.2 Telemetry Database Tour

This section will give you a brief overview of the Telemetry Database application. Although you will not see all of the application's functionality at this time, you should get a good feel for how the application works. This tutorial will lead you through the process of selecting a database file to work with and executing a query against the database. Go ahead and launch the Telemetry Database application from the Window's **Start** menu. Go to the Window's **Start** menu, select **Programs**, select **TReK**, and then select **Telemetry Database.** (Note: If you selected a Program Folder name other than **TReK** during installation, then that name will appear on the Start menu instead of TReK)

1. Go to the **File** menu in the Telemetry Database application and choose **Open Database**. Use the "Open Database" dialog shown in Figure 14 to browse for the TelemetryDatabase.mdb database file. This dialog will default to the TReK directory that contains the TReK database files (so you really shouldn't have to browse for the database file).

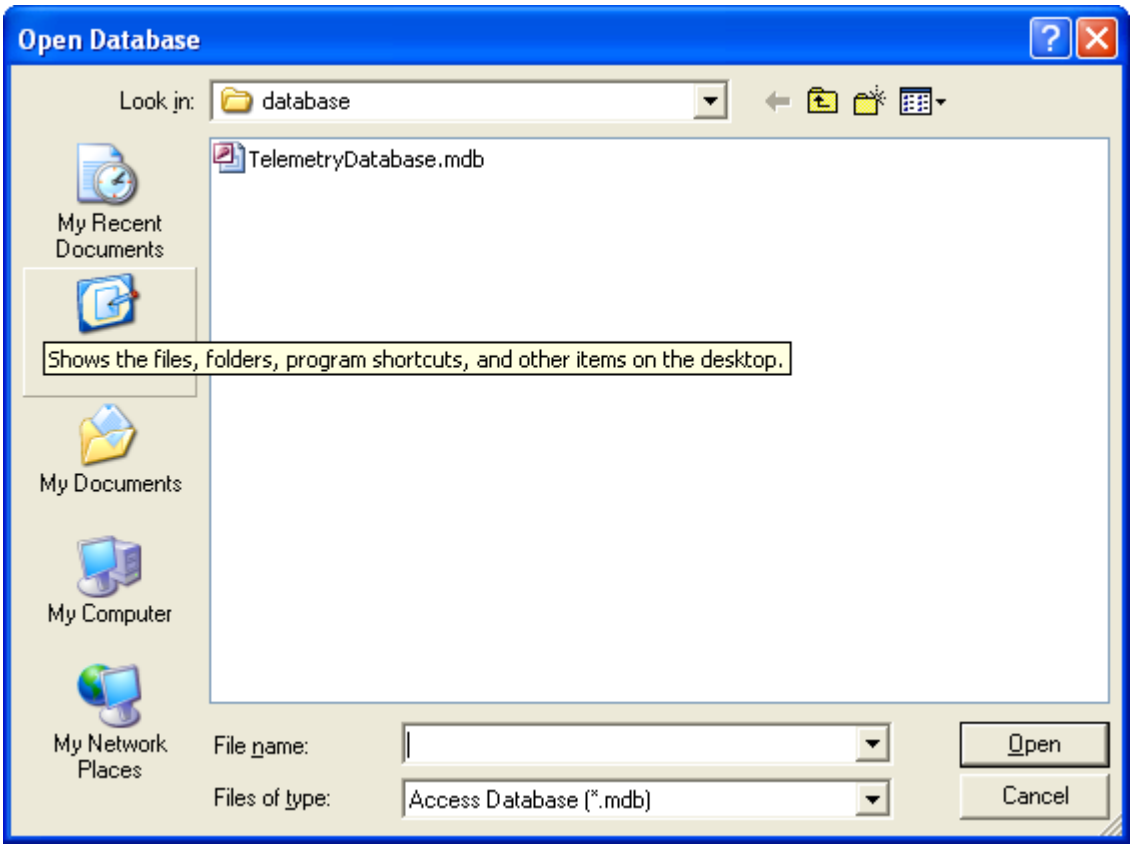

Figure 14 Open Database Dialog

Once you have selected a database, the path for that file will appear in the title bar of the main window as shown in Figure 15.

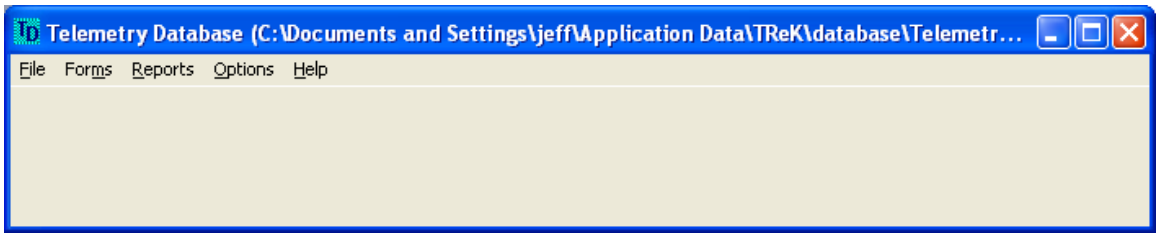

Figure 15 Telemetry Database Main Window

Now you're ready to bring up a form and make your first database query.

1. Go to the **Forms** menu, go down to the **Parameter Information** sub-menu, and then choose the **State Code…** option. This will bring up the State Code form shown in Figure 16.

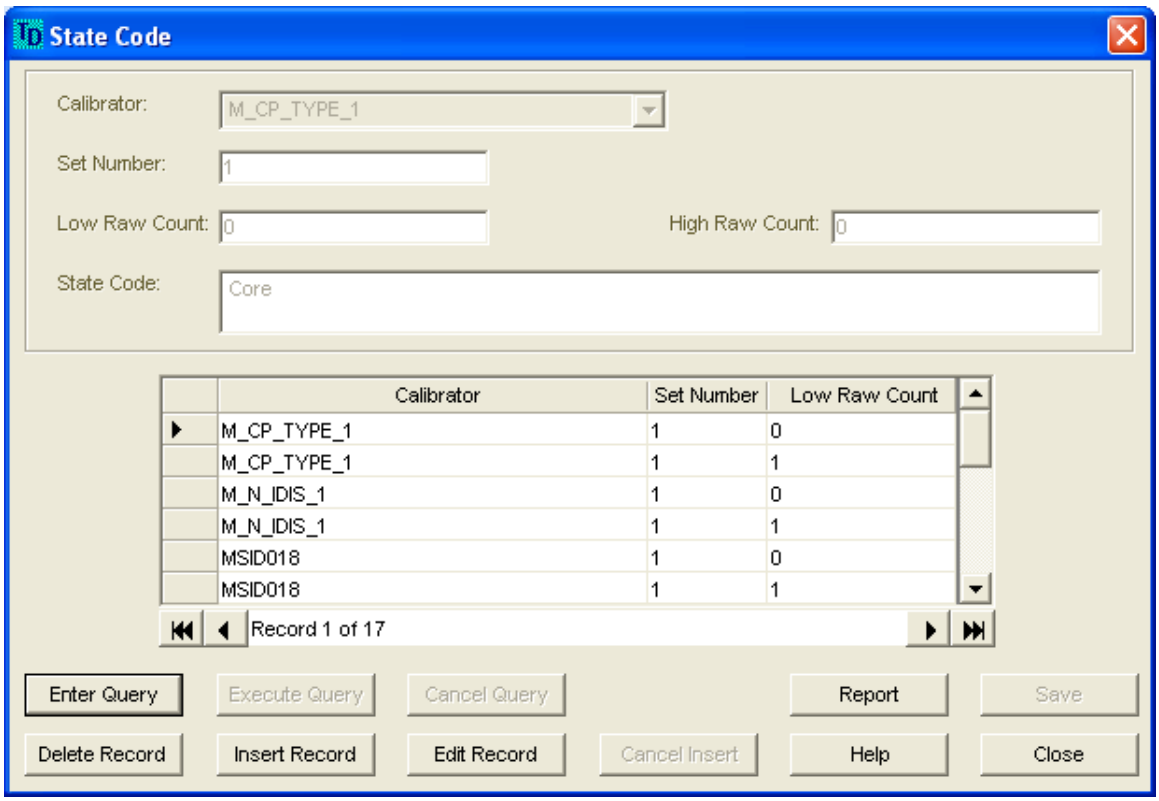

Figure 16 State Code Form on Startup

2. Push the **Enter Query** button. After pressing the button, the form should look like the one shown in Figure 17.

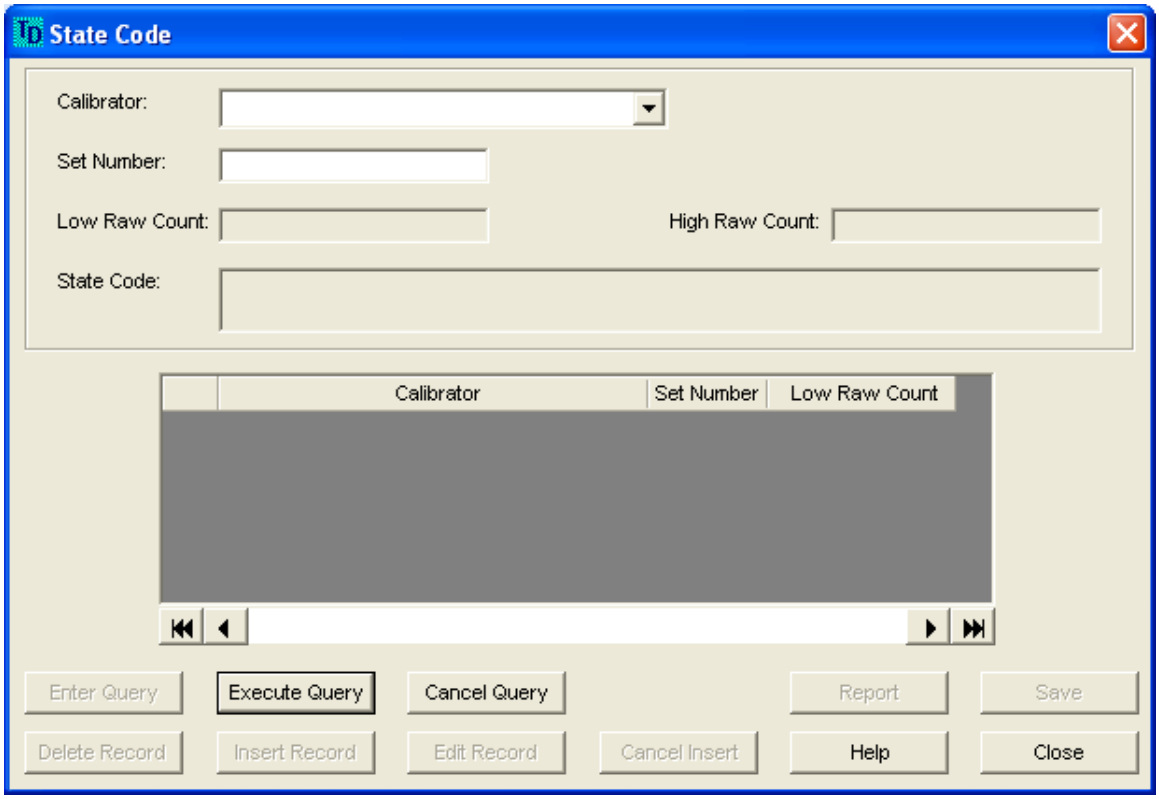

Figure 17 State Code Form after Enter Query

You are now in "Query" mode. As you can see, all the fields at the top of the form have been cleared, including the grid. All fields that cannot be queried against are now grayed out. You should notice that a different selection of buttons is enabled at the bottom. Once you selected the Enter Query button, the Execute Query and Cancel Query buttons were enabled, and most of the other buttons were disabled. This is a pattern that you will see throughout the forms. The Telemetry Database application will enable/disable command buttons to force you to finish one transaction before moving on to another.

You are now ready to enter the query into the Calibrator and Set Number fields.

3. Move your mouse into the Calibrator combo box and select the **MSID109** calibrator and leave the Set Number field blank. The form should now look like the one shown in Figure 18. This action will set up a query to search the State Code table for all records with a MSID109 calibrator. Go ahead and push the **Execute Query** button.

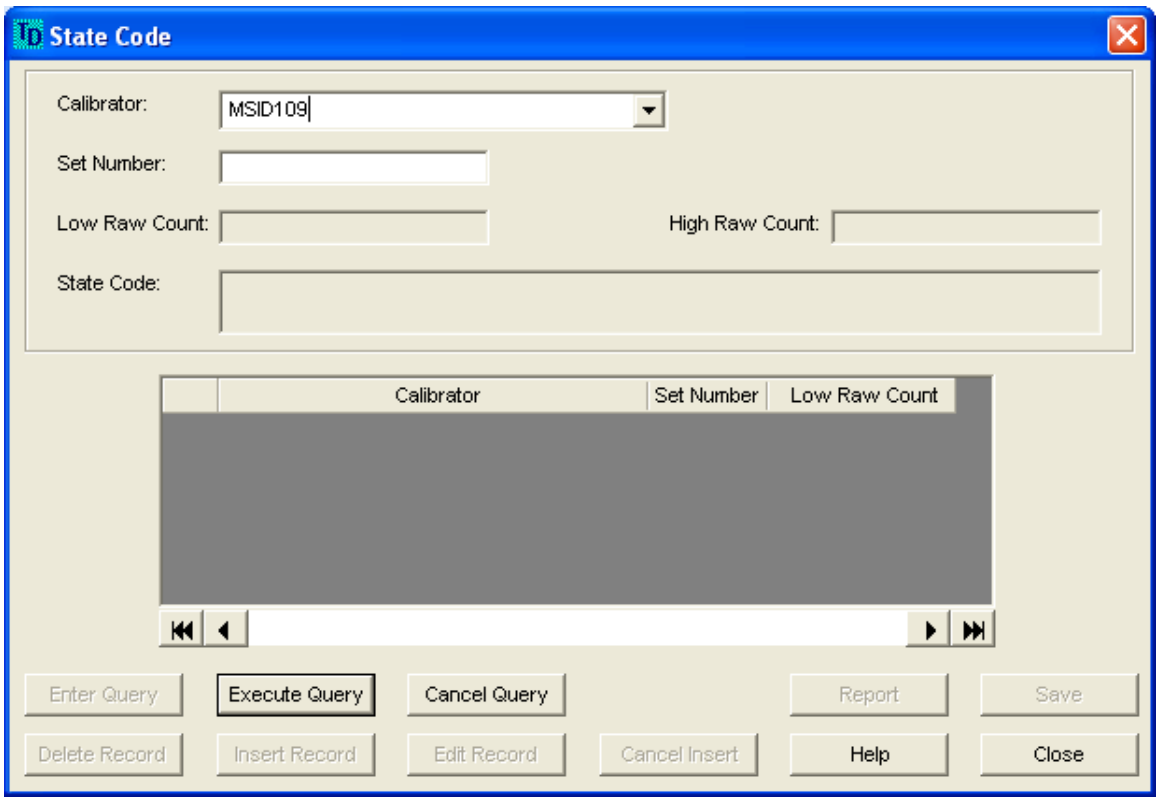

Figure 18 State Code Form with a Query Entered

After the query, your form should look like the one shown in Figure 19. Keep in mind, that selecting the Cancel Query option would have taken the form back to its previous state.

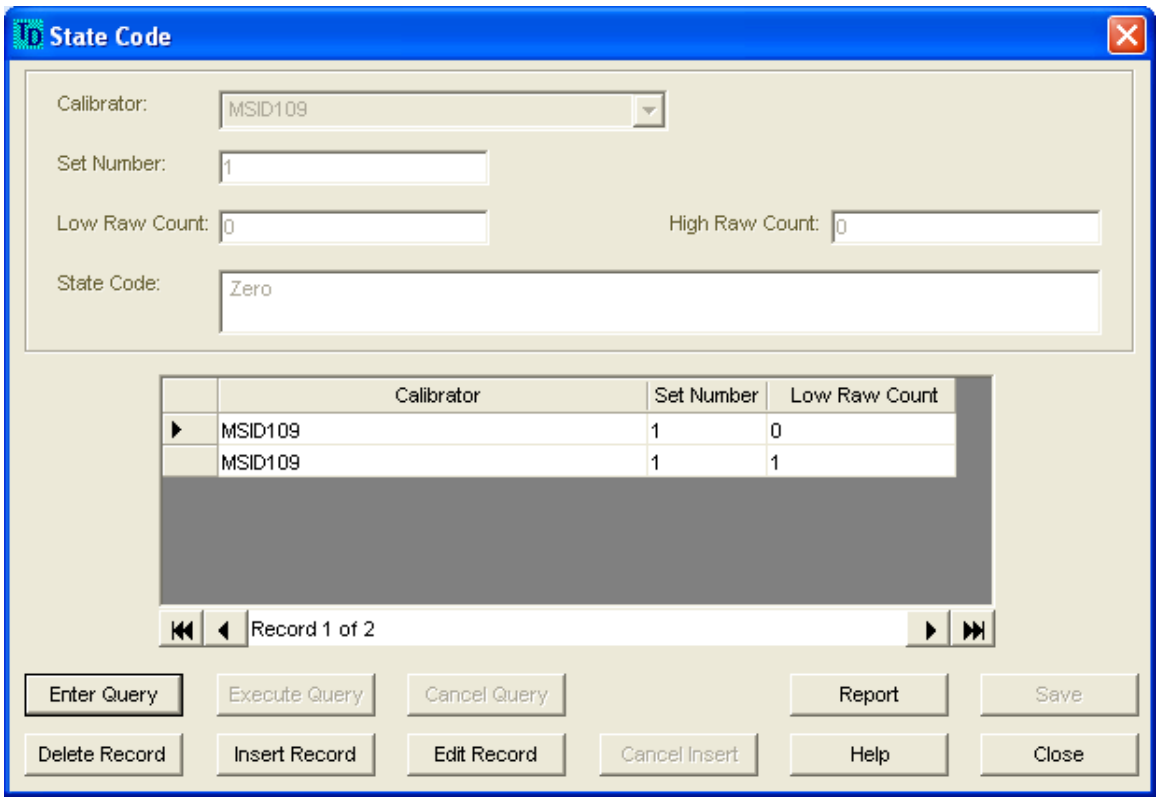

Figure 19 State Code Form after Execute Query

The query has allowed you to limit the number of records that you work with.

4. Push the **Close** button to close the form.

5. Exit the Telemetry Database application by going to the **File** menu and selecting **Exit**.

5.3 Commanding Tour

This section will show you how to establish a POIC destination, uplink a command, and view command responses. Since you're going through this step-by-step tutorial before you've read any of the other TReK documentation, you may not understand everything you see. However, this is a good opportunity to jump in and get a first-hand look at the TReK commanding software before you start digging into the details.

1. You can start the Command Processing application by using the Window's **Start** menu. Go to the Window's **Start** menu, select **Programs**, select **TReK**, and then select **Command Processing.** (Note: If you selected a Program Folder name other than **TReK** during installation, then that name will appear on the Start menu instead of **TReK**). The **Command Processing** main window as shown in Figure 20 will appear on your screen.

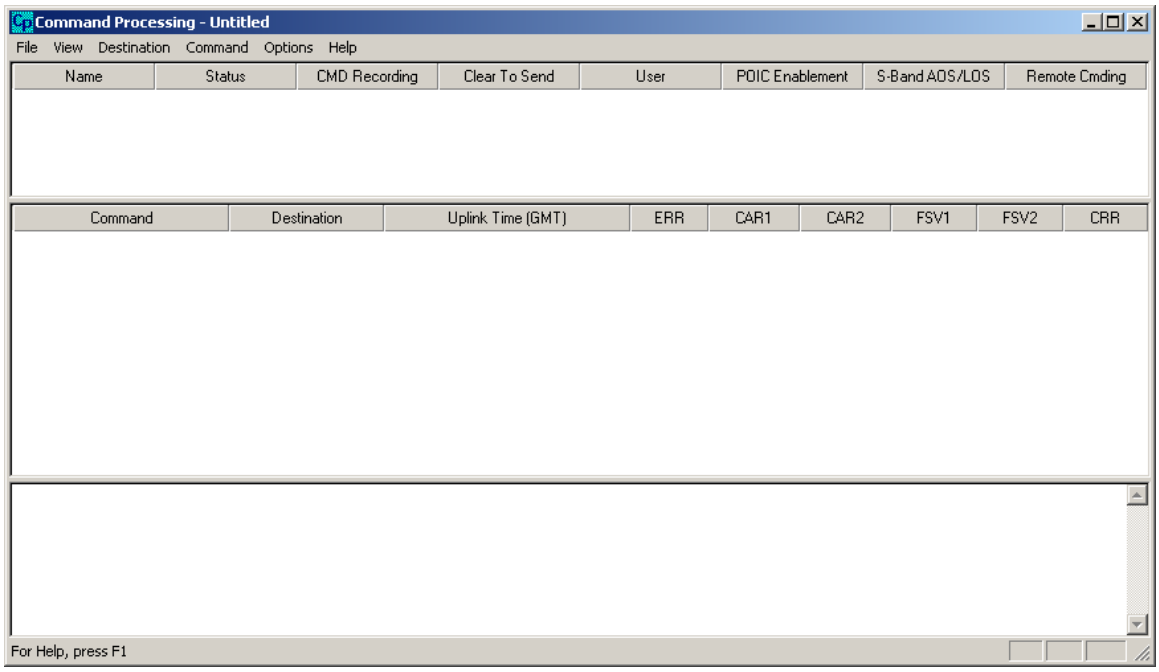

Figure 20 Command Processing Main Window

The first step we need to perform is to establish a POIC destination (this is how we create a commanding connection with the POIC). When you establish a command connection with the POIC you will actually be creating two network connections. One network connection will be with the EHS Remote Interface System (ERIS) and the other is with the POIC command system. The Add POIC Destination dialog is used to enter all the information needed to establish both network connections.

2. Go to the Command Processing **Destination** menu and select **Add POIC Destination**. The **Add POIC Destination** dialog shown in Figure 21 will appear.

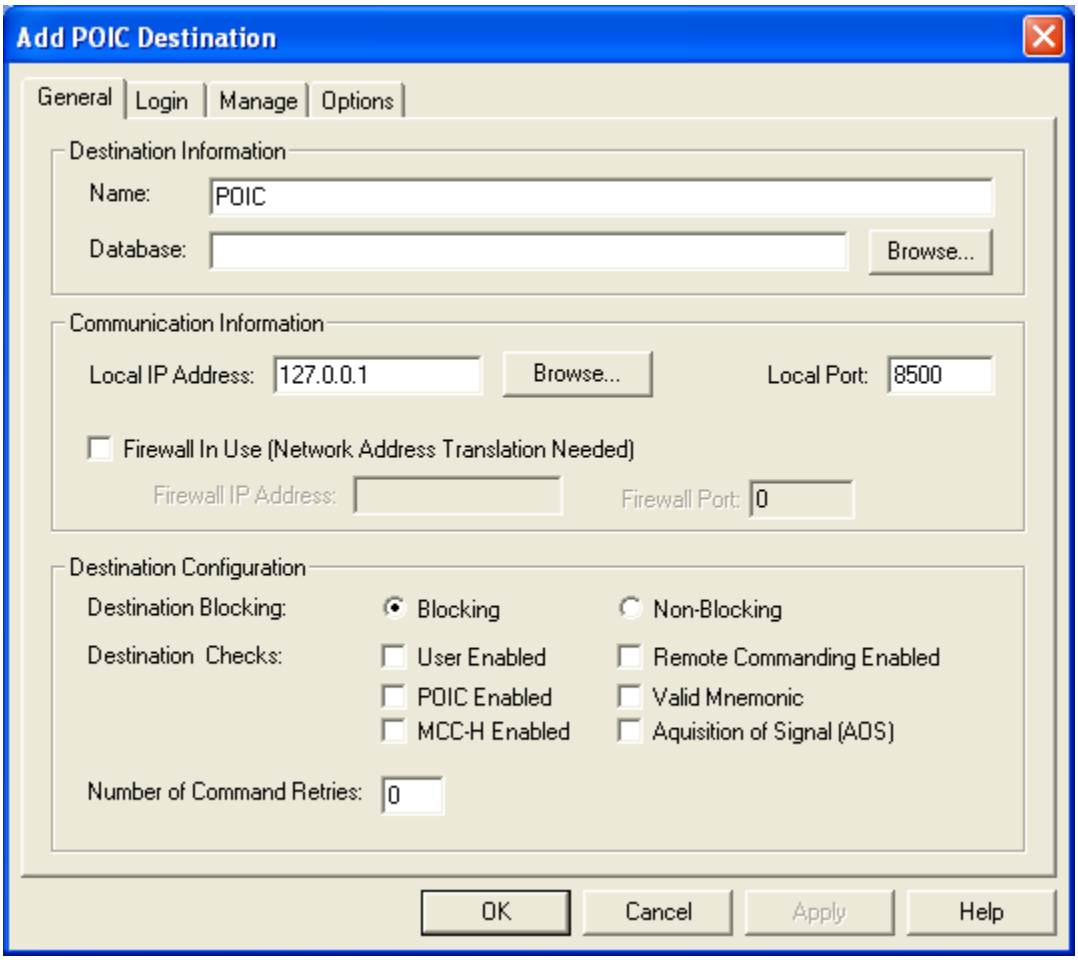

Figure 21 Add POIC Destination Dialog

3. In the Add POIC Destination (General Tab) dialog enter the following information:

   Database: <Full Path>\CommandDatabase.mdb
   Hint: Don't forget to enter the full directory path. The Browse button provides a way to select the database and will fill in the full directory path for you.

The Local IP Address should have defaulted to your local IP address. If it didn't please update this field with a valid local IP address. [If you are working on a computer that doesn't have a network card please enter the loopback address (127.0.0.1)]. There is no need to change any of the default data in the other fields on this tab. Now we need to enter the information needed to establish the ERIS network connection. Please select the **Login** tab. You should see the tab shown in Figure 22.

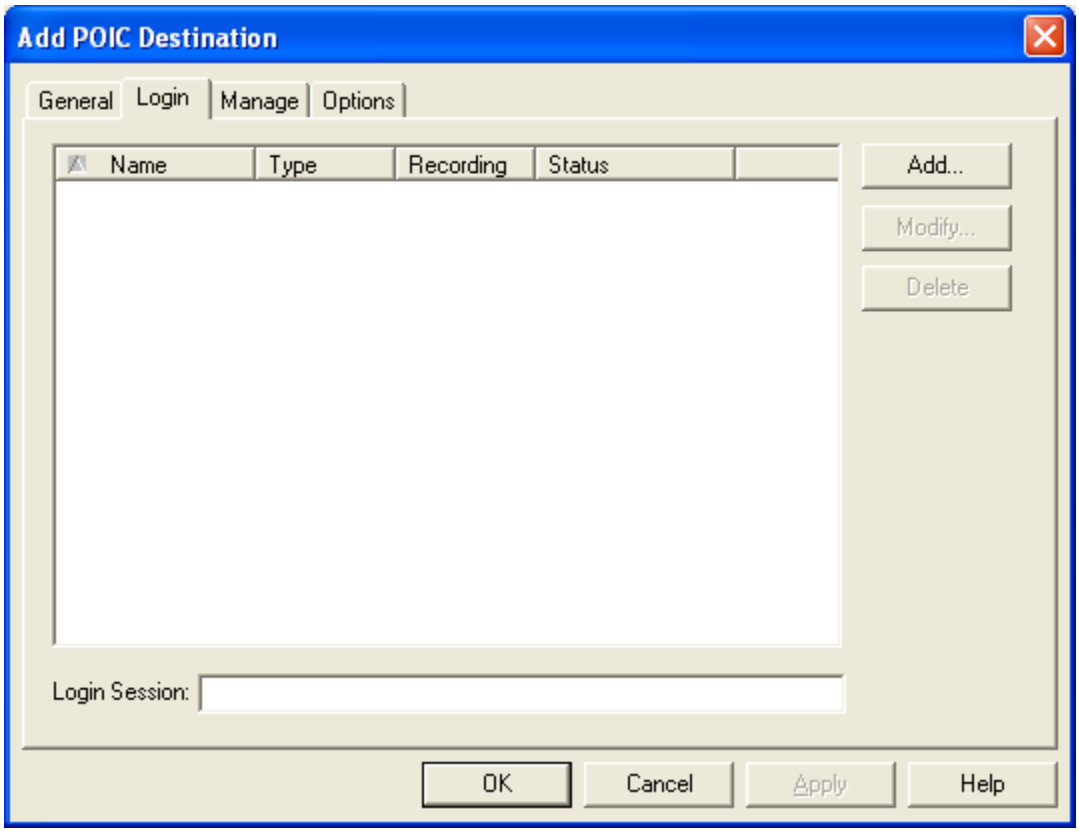

Figure 22 Add POIC Destination (Login Tab) Dialog

4. In the Add POIC Destination (Login Tab) dialog push the Add button. The dialog shown in Figure 23 should appear.

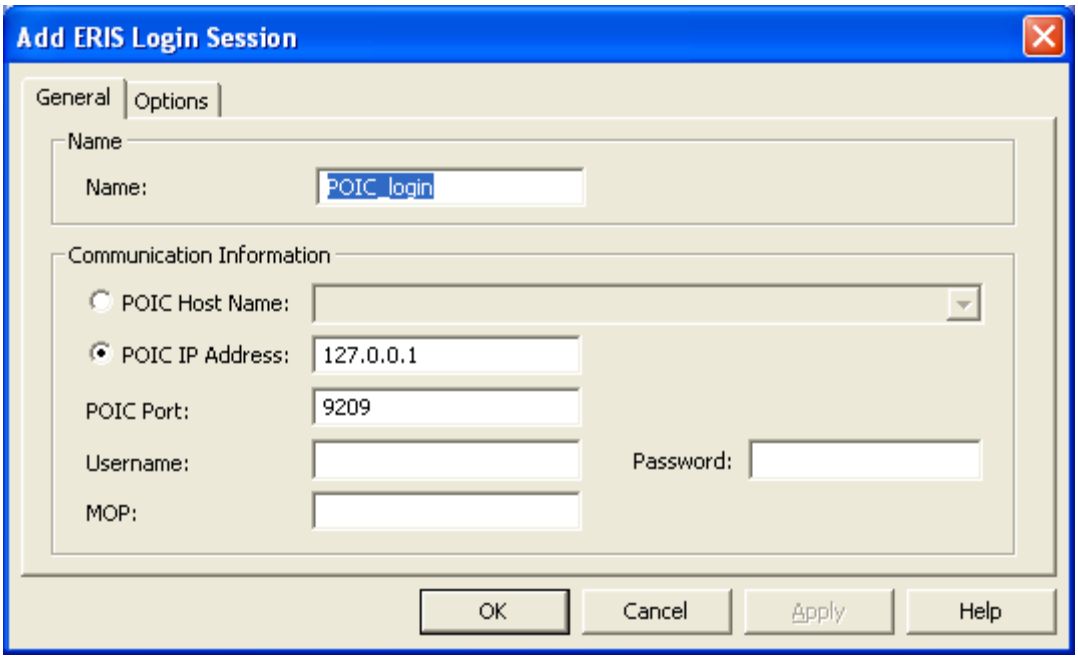

Figure 23 Add ERIS Login Session Dialog

5. In the Add ERIS Login Session (General Tab) dialog enter the following information:

   POIC IP Address: Enter your local IP Address in this field. Normally you would enter the firewall address for a POIC computer. However, in this situation the POIC is going to be simulated by the Command Trainer application which is going to be running locally on your computer. Therefore, we need to enter the local IP address that will be used by the Command Trainer application instead of the real POIC IP Address. Please note both the POIC IP Address and POIC Port Number that you have entered in this dialog. You will need to verify that you are using the same IP Address and Port Number on the Command Trainer side when we get to that part of the tutorial.

6. After you have entered the POIC IP Address information, push the OK button.

7. There is no need to change any of the default data in the other fields on the Login tab. While there are other things to know about the Add POIC Destination dialog this is all we need to do for this step-by-step tutorial. Please push the **OK** button in the Add POIC Destination dialog.

At this point you should see the POIC destination in the Command Processing main window destination list as shown in Figure 24.

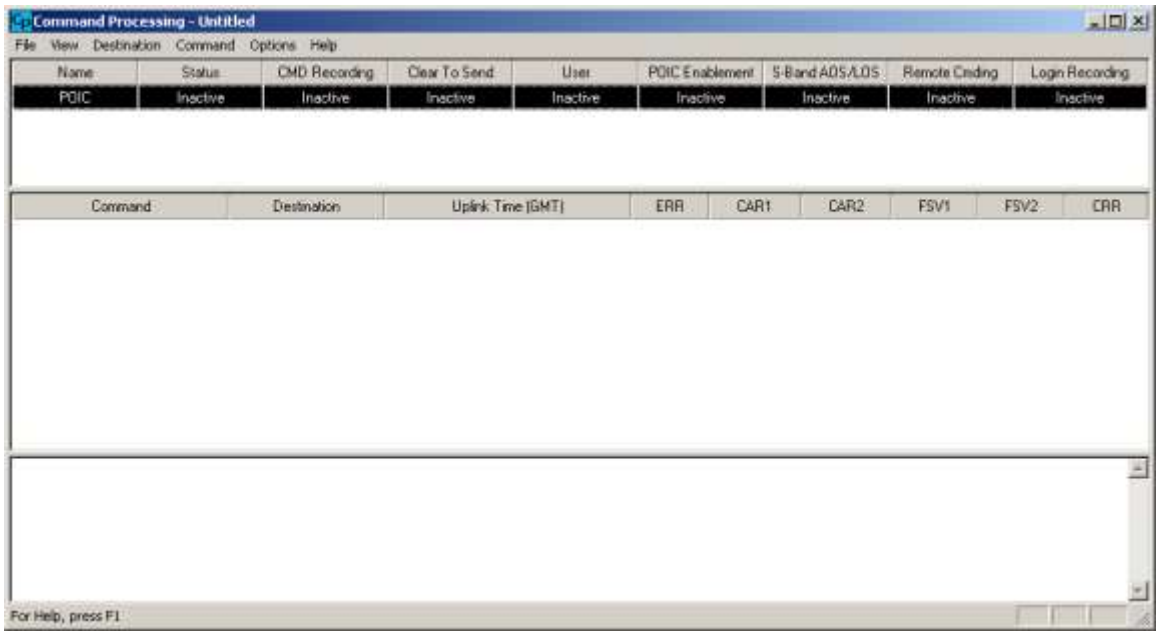

Figure 24 Command Processing with POIC Destination in Destination List

Now we need to start the **Command Trainer** application that will simulate the POIC.

You can start the Command Trainer application by using the Window's **Start** menu. From the **Start** menu select **Programs**, select **TReK**, and then select **Command Trainer.** (Note: If you selected a Program Folder name other than **TReK** during installation, then that name will appear on the Start menu instead of **TReK**). The **Command Trainer** main window as shown in Figure 25 will appear on your screen.

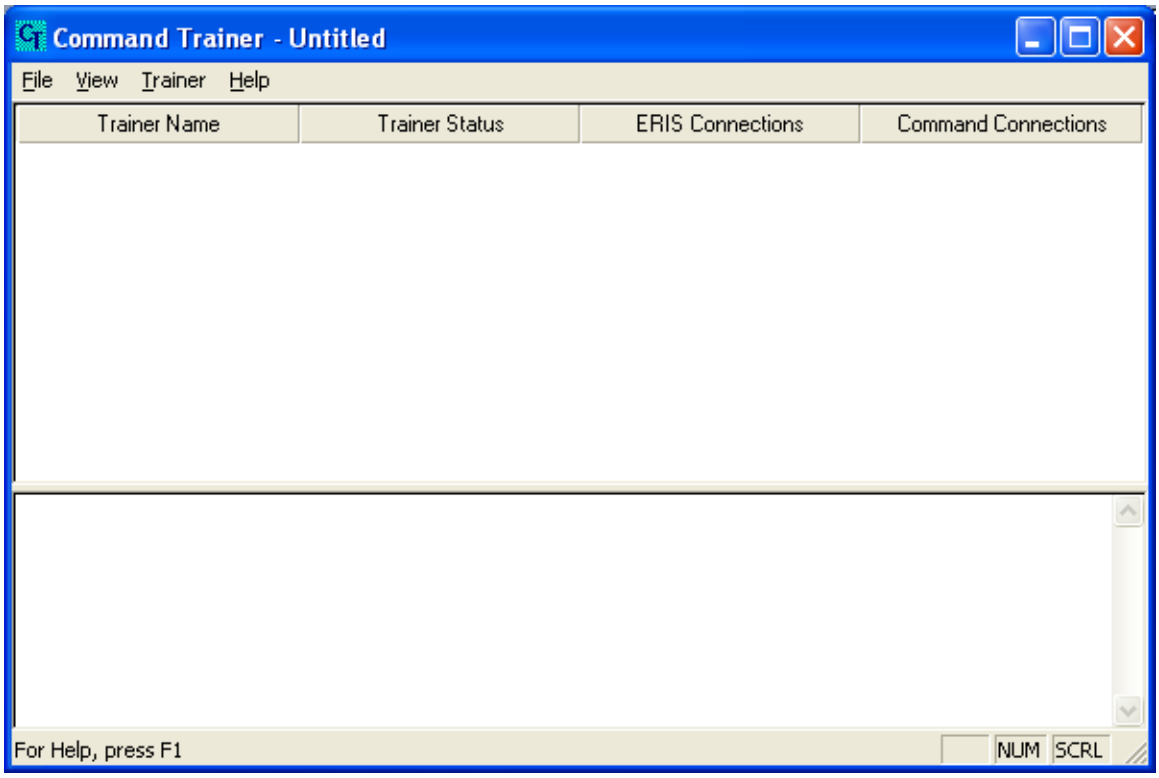

Figure 25 Command Trainer Main Window

8. Go to the **Trainer** menu and select **Add POIC Trainer**. The **Add POIC Trainer** dialog as shown in Figure 26 will appear.

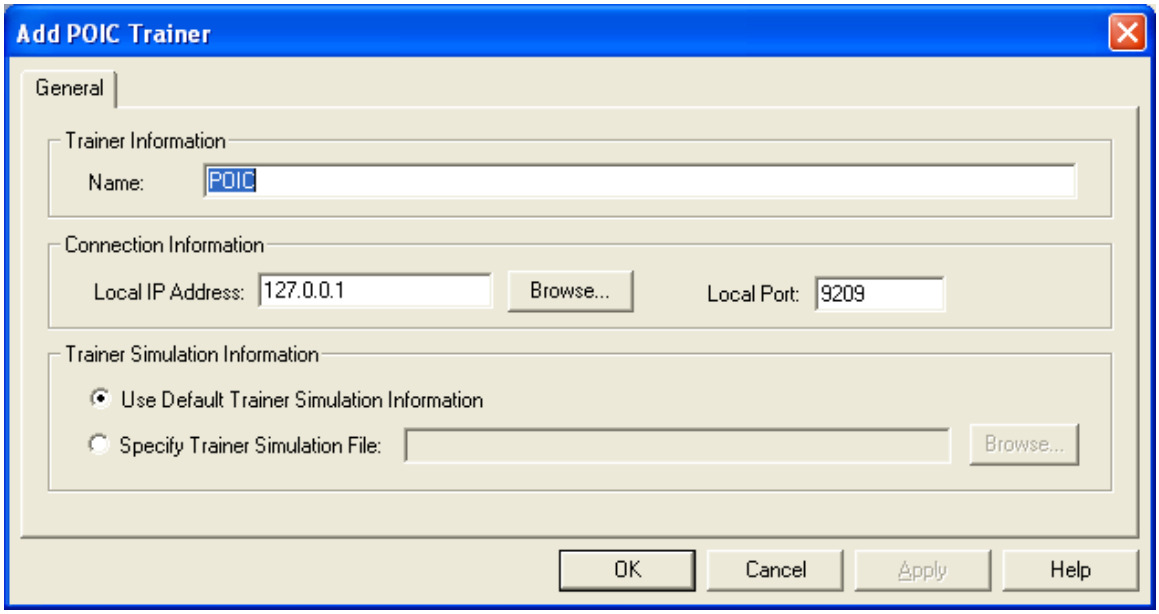

Figure 26 Add POIC Trainer Dialog

9. In the **Add POIC Trainer** dialog make sure the **Local IP Address** is the same address that you entered for the POIC Address on the Login tab in the Add POIC Destination dialog. Also make sure the Local Port is the same as the POIC Port number. These two addresses and port numbers must match. The Command Processing application is going to establish a Transmission Control Protocol (TCP) network connection with the Command Trainer application and this is the IP address that will be used for that connection.

   When you are done checking (and possibly updating) this information push the **OK** button. You should now see the trainer listed in the Command Trainer main window trainer list as shown in Figure 27.

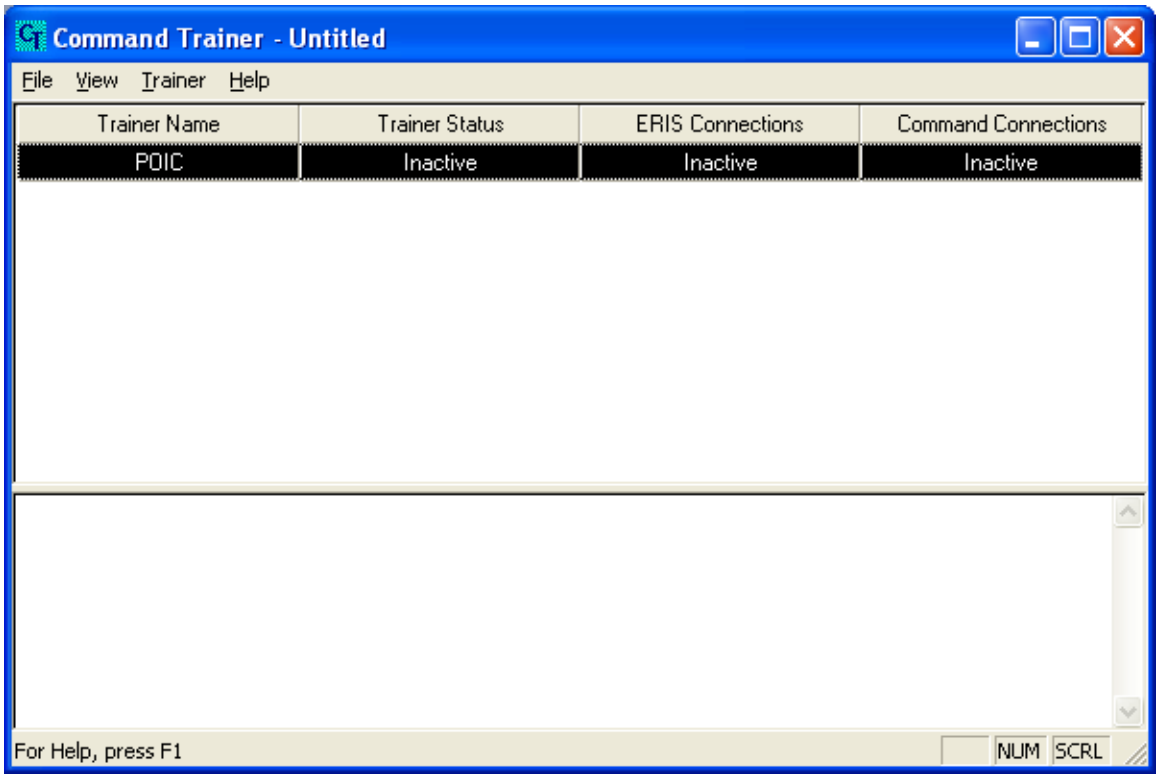

Figure 27 Command Trainer with POIC Trainer in Trainer List

10. Select the POIC trainer in the Command Trainer application's main window trainer list. The row should be highlighted (as shown in Figure 27). Now go to the **Trainer** menu and select **Activate Trainer**. You will see the color of the trainer change to green and a message in the message area of the main window indicating that the trainer has been activated. Notice that the ERIS Connections and Command Connections columns show 0. This is because at this point no connections have been established.

11. Now go to the Command Processing application. **Select** the POIC destination in the Command Processing application's main window destination list. The row

should be highlighted. Go to the **Destination** menu in the Command Processing application and select **Activate Destination**. You will see the color of the destination change to purple and the status change to initializing. You will also be prompted with the Login dialog shown in Figure 28.

Figure 28 Login Dialog

12. In the **Login** dialog enter the following information and push the **OK** button:

Username:	captain
Password:	kirk
Passcode:	12345678

At this point you will be prompted with the **Select Role** dialog shown in Figure 29 Select Role Dialog. Just push the **OK** button (this will accept the default Role that is highlighted).

Figure 29 Select Role Dialog

Next you will be prompted with the **Select MOP** dialog shown in Figure 30. Just push the **OK** button (this will accept the default MOP that is highlighted).

Figure 30 Select MOP Dialog

The POIC destination should turn green. This indicates that you have now established both network connections with the POIC (with the Command Trainer in this case). Notice that the Command Trainer is now showing 1 ERIS connection and 1 Command Connection. You are now ready to perform a variety of commanding functions.

Note: If something went wrong and the destination failed to activate, chances are it's because there is an IP address or port number mismatch.

13. Go to the **Command Processing** application, select the **Command** menu, and then select the **Commands** menu item. This will display the Commands dialog shown in Figure 31.

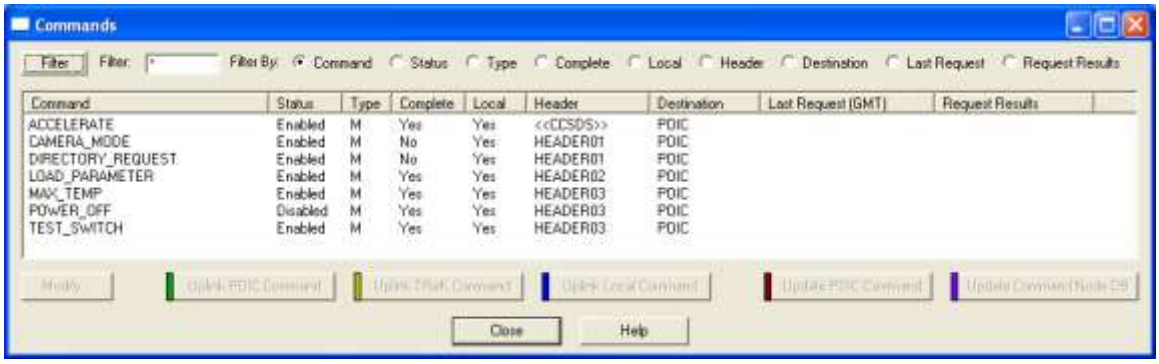

Figure 31 Commands Dialog

14. In the **Commands** dialog select the **CAMERA_MODE** command and push the **Uplink POIC Command** button. This will uplink the command (send it to the Command Trainer application). Notice the Last Request and Request Results columns in the Commands dialog as shown in Figure 32. These columns have been updated with information about the results of your command uplink request.

Figure 32 Results of Command Uplink Request

15. Push the **Close** button in the **Commands** dialog to close the **Commands** dialog.

16. Look at the middle of the Command Processing Main Window (shown in Figure 33). This is called the Main Window Command Track area. You now see the CAMERA_MODE command in the command track list, along with the name of the destination where the command was sent, the command uplink time, and information about each command response that was received.

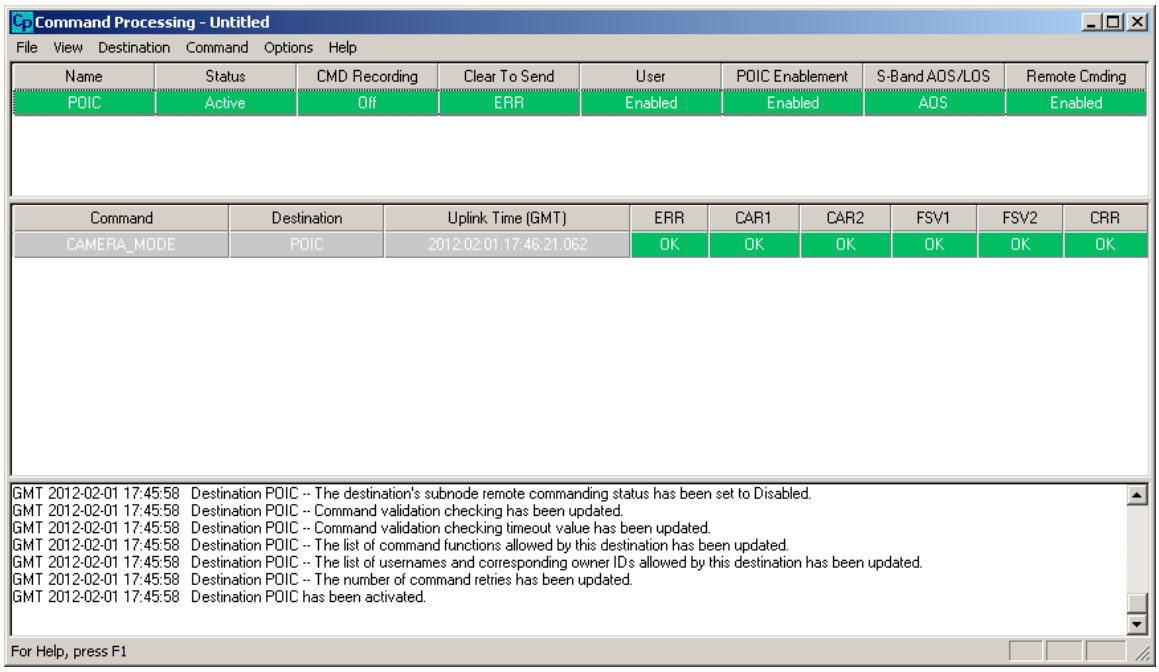

Figure 33 Command Response Information

Congratulations! You have now learned how to establish a command connection, uplink a command, and view command response information. For more information about commanding please go through the Command Applications Tutorial (TREK-USER-021). This is the end of the commanding tour so it's okay to exit the Command Processing and

Command Trainer applications. The next stop on the tour is the Command Database application.

5.4 Command Database Tour

This section will give you a brief overview of the Command Database application. Although you will not see all of the application's functionality at this time, you should get a good feel for how the application works. This tutorial will lead you through the process of selecting a database file to work with and executing a query against the database. Go ahead and launch the Command Database application from the Window's **Start** menu. Go to the Window's **Start** menu, select **Programs**, select **TReK**, and then select **Command Database.**

1. Go to the **File** menu in the Command Database application and choose **Open Database**. Use the "Open Database" dialog shown in Figure 34 to browse for the CommandDatabase.mdb database file. This dialog will default to the TReK directory that contains the TReK command database files (so you really shouldn't have to browse for the database file).

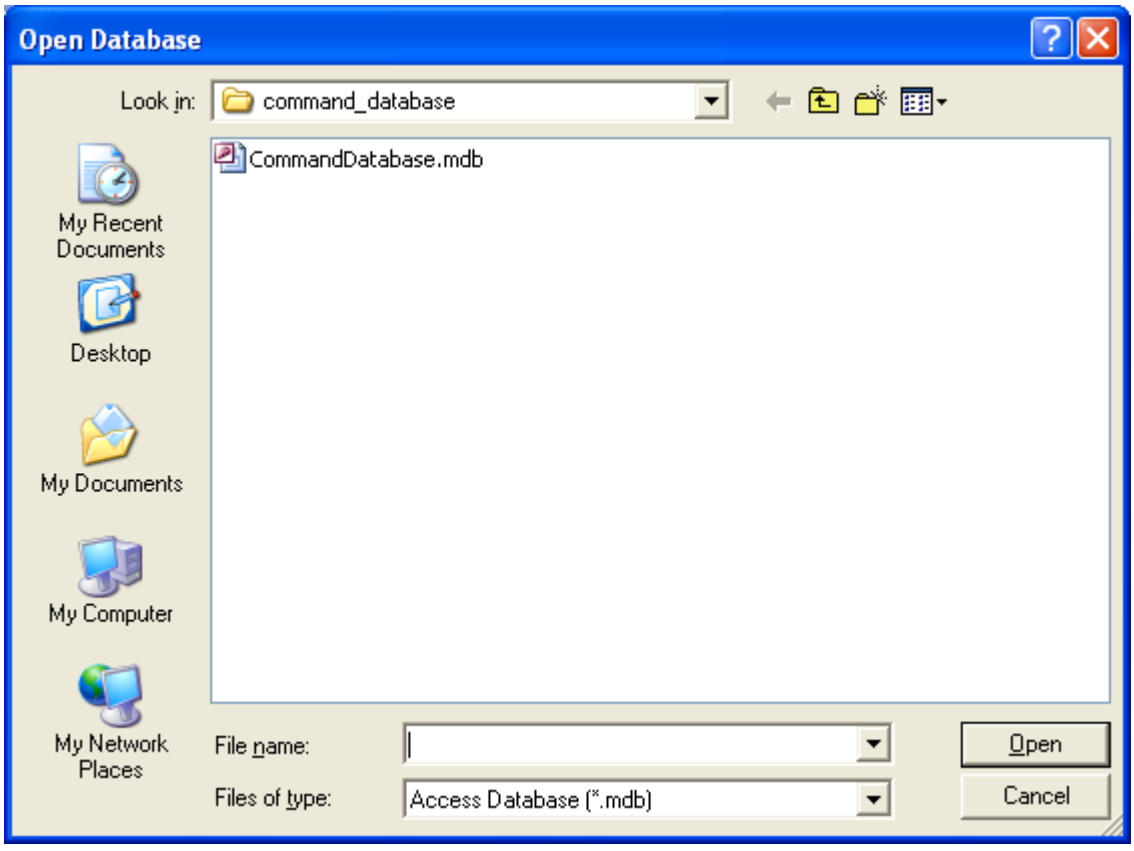

Figure 34 Open Database Dialog

Once you have selected a database, the path for that file will appear in the title bar of the main window as shown in Figure 35.

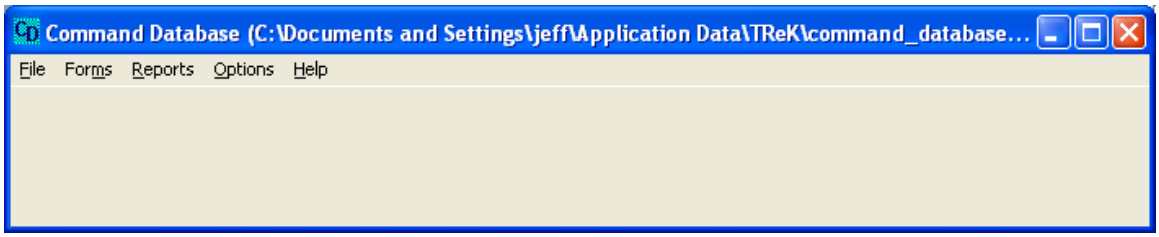

Figure 35 Command Database Main Window

Now you're ready to bring up a form and make your first database query.

2. Go to the **Forms** menu, go down to the **Header Information** sub-menu, and then choose the **Header…** option. This will bring up the Header form shown in Figure 36.

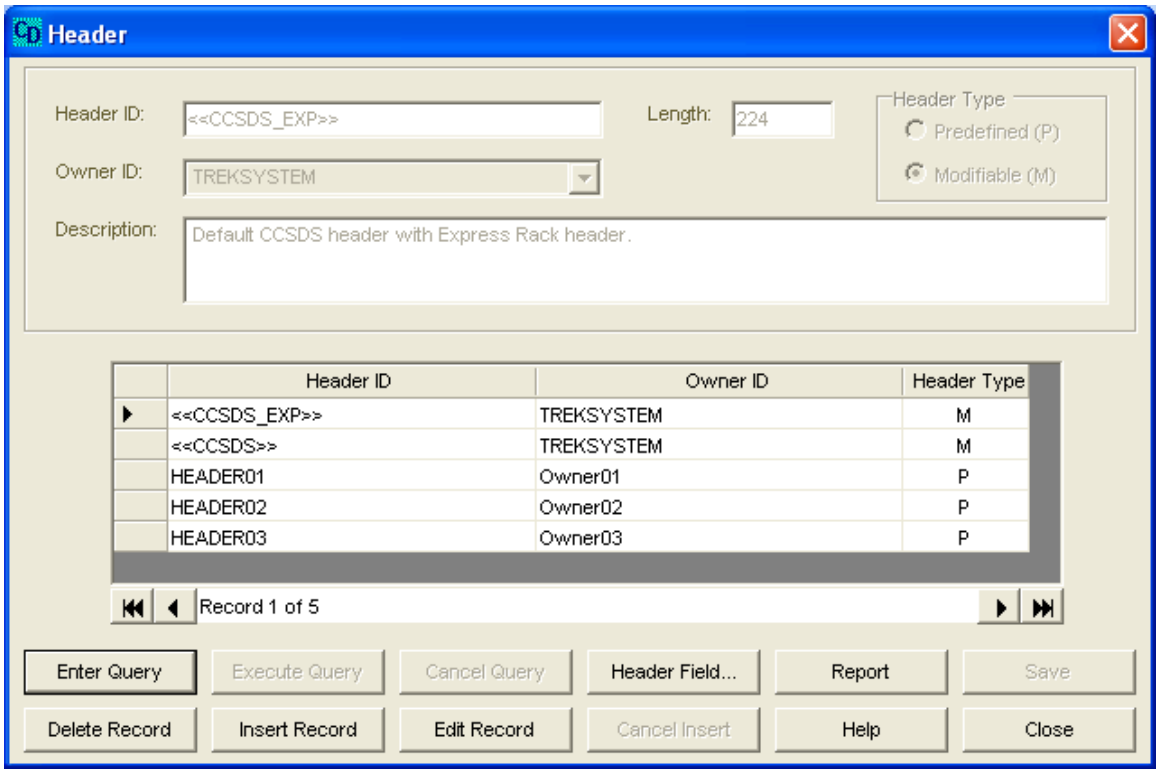

Figure 36 Header Form

3. Push the **Enter Query** button. After pressing the button, the form should look like the one shown in Figure 37.

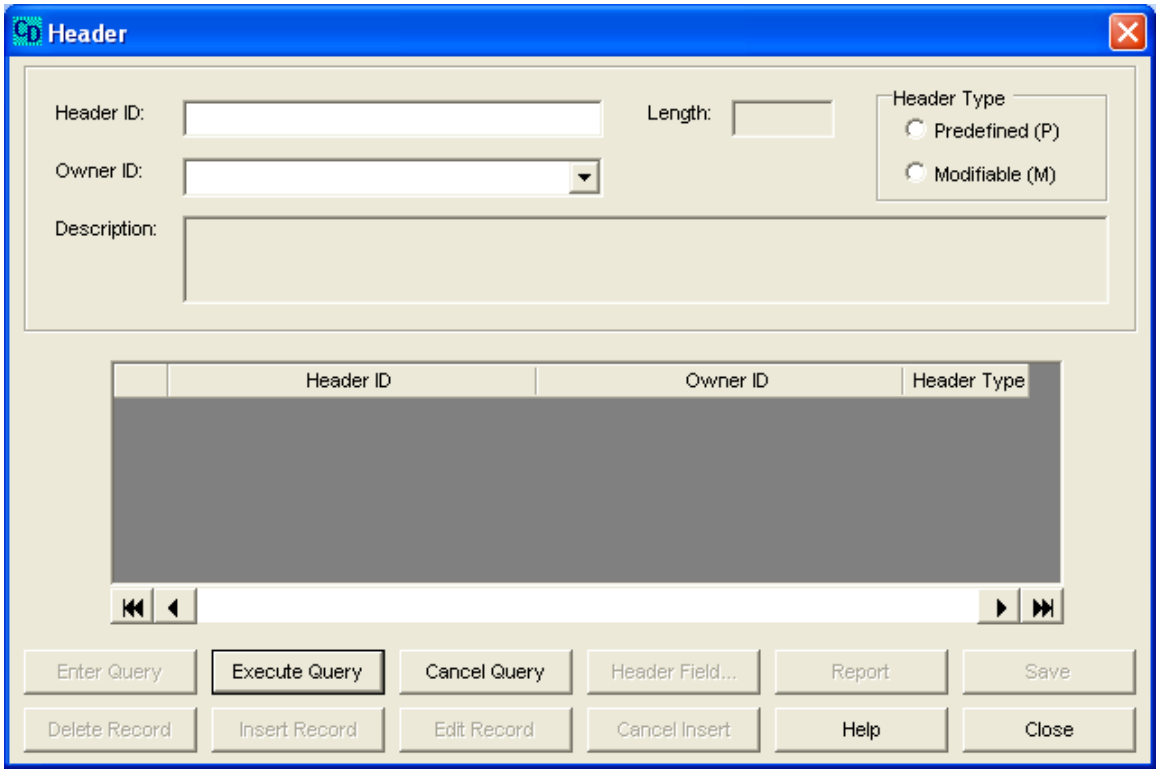

Figure 37 Header Form after Enter Query

You are now in "Query" mode. As you can see, all the fields at the top of the form have been cleared, including the grid. All fields that cannot be queried against are now grayed out. You should notice that a different selection of buttons is enabled at the bottom. Once you selected the Enter Query button, the Execute Query and Cancel Query buttons were enabled, and most of the other buttons were disabled. This is a pattern that you will see throughout the forms. The Command Database application will enable/disable command buttons to force you to finish one transaction before moving on to another.

You are now ready to enter the query into the Header ID, Owner ID, and Header Type fields.

4. With your mouse select the **Predefined (P)** Header Type option and leave both the Header ID and the Owner ID fields blank. The form should now look like the one shown in Figure 38. This action will set up a query to search the Header table for all records (or headers) with a Header Type of Predefined. Go ahead and push the **Execute Query** button.

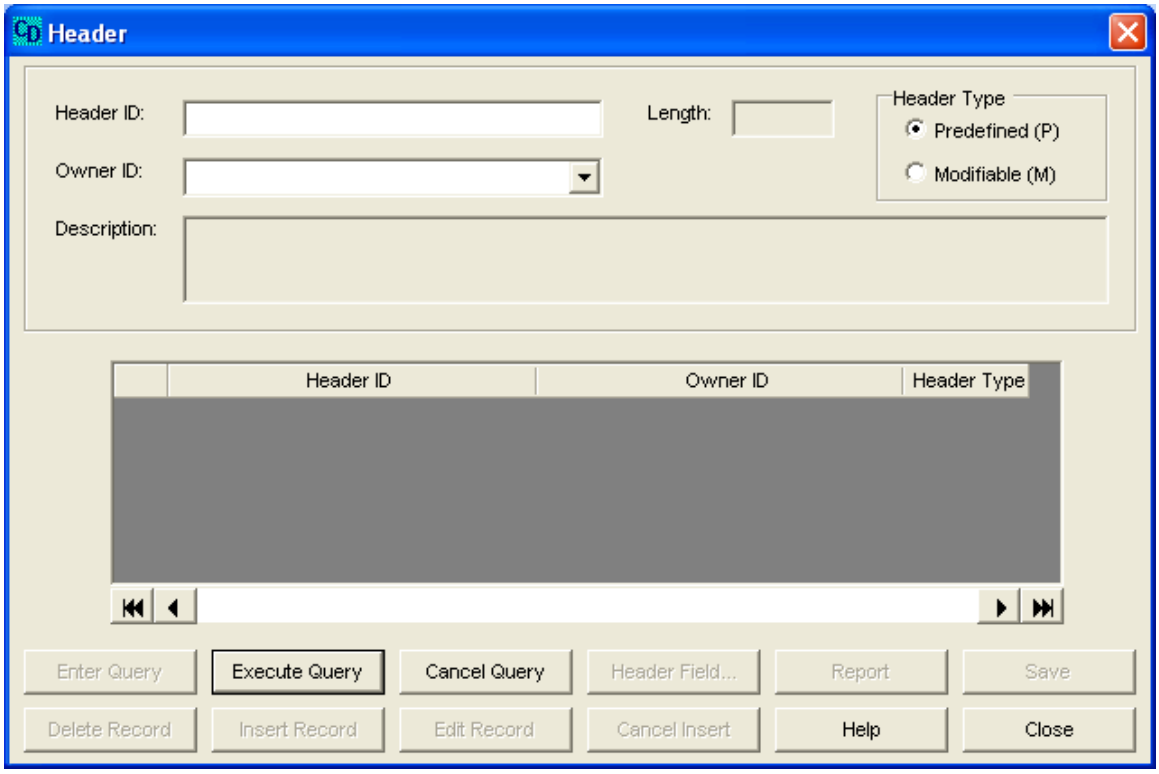

Figure 38 Header Form with a Query Entered

After the query, your form should look like the one shown in Figure 39. Keep in mind, that selecting the Cancel Query option would have taken the form back to its previous state.

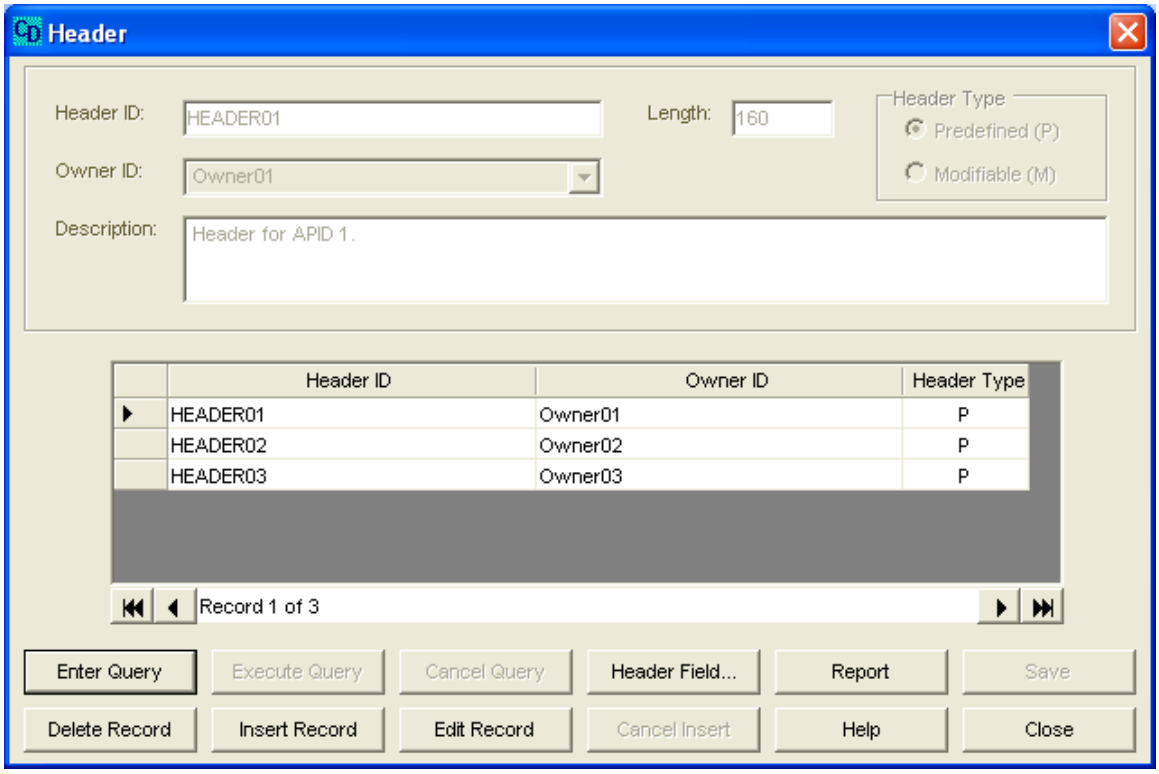

Figure 39 Header Form after Execute Query

The query has allowed you to limit the number of records that you work with.

5. Push the Close button to close the form.

6. Exit the Command Database application by going to the File menu and selecting Exit.

Appendix A Glossary

Note: This Glossary is global to all TReK documentation. All entries listed may not be referenced within this document.

Application Programming Interface (API)	A set of functions used by an application program to provide access to a system's capabilities.
Application Process Identifier	An 11-bit field in the CCSDS primary packet header that identifies the source-destination pair for ISS packets. The type bit in the primary header tells you whether the APID is a payload or system source-destination.
Calibration	The transformation of a parameter to a desired physical unit or text state code.
Communications Outage Recorder	System that captures and stores payload science, health and status, and ancillary data during TDRSS zone of exclusion.
Consultative Committee for Space Data Systems (CCSDS) format	Data formatted in accordance with recommendations or standards of the CCSDS.
Consultative Committee for Space Data Systems (CCSDS) packet	A source packet comprised of a 6-octet CCSDS defined primary header followed by an optional secondary header and source data, which together may not exceed 65535 octets.
Conversion	Transformation of downlinked spacecraft data types to ground system platform data types.
Custom Data Packet	A packet containing a subset of parameters that can be selected by the user at the time of request.
Cyclic Display Update Mode	A continuous update of parameters for a particular display.
Decommutation (Decom)	Extraction of a parameter from telemetry.
Discrete Values	Telemetry values that have states (e.g., on or off).

Dump	During periods when communications with the spacecraft are unavailable, data is recorded onboard and played back during the next period when communications resume. This data, as it is being recorded onboard, is encoded with an onboard embedded time and is referred to as dump data.
Enhanced HOSC System (EHS)	Upgraded support capabilities of the HOSC systems to provide multi-functional support for multiple projects. It incorporates all systems required to perform data acquisition and distribution, telemetry processing, command services, database services, mission support services, and system monitor and control services.
Exception Monitoring	A background process capable of continuously monitoring selected parameters for Limit or Expected State violations. Violation notification is provided through a text message.
Expected State Sensing	Process of detecting a text state code generator in an off-nominal state.
File transfer protocol (ftp)	Protocol to deliver file-structured information from one host to another.
Flight ancillary data	A set of selected core system data and payload health and status data collected by the USOS Payload MDM, used by experimenters to interpret payload experiment results.
Grayed out	Refers to a menu item that has been made insensitive, which is visually shown by making the menu text gray rather than black. Items that are grayed out are not currently available.
Greenwich Mean Time (GMT)	The solar time for the meridian passing through Greenwich, England. It is used as a basis for calculating time throughout most of the world.

Ground ancillary data	A set of selected core system data and payload health and status data collected by the POIC, which is used by experimenters to interpret payload experiment results. Ground Ancillary Data can also contain computed parameters (pseudos).
Ground receipt time	Time of packet origination. The time from the IRIG-B time signal received.
Ground Support Equipment (GSE)	GSE refers to equipment that is brought in by the user (i.e. equipment that is not provided by the POIC).
Ground Support Equipment Packet	A CCSDS Packet that contains data extracted from any of the data processed by the Supporting Facility and the format of the packet is defined in the Supporting Facility's telemetry database.
Huntsville Operations Support Center (HOSC)	A facility located at the Marshall Space Flight Center (MSFC) that provides scientists and engineers the tools necessary for monitoring, commanding, and controlling various elements of space vehicle, payload, and science experiments. Support consists of real-time operations planning and analysis, inter- and intra-center ground operations coordination, facility and data system resource planning and scheduling, data systems monitor and control operations, and data flow coordination.
Limit Sensing	Process of detecting caution and warning conditions for a parameter with a numerical value.
Line Outage Recorder Playback	A capability provided by White Sands Complex (WSC) to play back tapes generated at WSC during ground system communication outages.
Measurement Stimulus Identifier (MSID)	Equivalent to a parameter.
Monitoring	A parameter value is checked for sensing violations. A message is generated if the value is out of limits or out of an expected state.
Parameter	TReK uses the generic term parameter to mean any

	piece of data within a packet. Sometimes called a measurement or MSID in POIC terminology.
Payload Data Library (PDL)	An application that provides the interface for the user to specify which capabilities and requirements are needed to command and control his payload.
Payload Data Services Systems (PDSS)	The data distribution system for ISS. Able to route data based upon user to any of a number of destinations.
Payload Health and Status Data	Information originating at a payload that reveals the payload's operational condition, resource usage, and its safety/anomaly conditions that could result in damage to the payload, its environment or the crew.
Payload Operations Integration Center (POIC)	Manages the execution of on-orbit ISS payloads and payload support systems in coordination/unison with distributed International Partner Payload Control Centers, Telescience Support Centers (TSC's) and payload-unique remote facilities.
Playback	Data retrieved from some recording medium and transmitted to one or more users.
Pseudo Telemetry (pseudo data)	Values that are created from calculations instead of directly transported telemetry data. This pseudo data can be created from computations or scripts and can be displayed on the local PC.
Remotely Generated Command	A command sent by a remote user whose content is in a raw bit pattern format. The commands differ from predefined or modifiable commands in that the content is not stored in the POIC Project Command Database (PCDB).
Science data	Sensor or computational data generated by payloads for the purpose of conducting scientific experiments.

Subset	A collection of parameters from the total parameter set that is bounded as an integer number of octets but does not constitute the packet itself. A mini-packet.
Super sampled	A parameter is super sampled if it occurs more than once in a packet.
Swap Type	A flag in the Parameter Table of the TReK database that indicates if the specified datatype is byte swapped (B), word swapped (W), byte and word swapped (X), byte reversal (R), word reversal (V) or has no swapping (N).
Switching	A parameter's value can be used to switch between different calibration and sensing sets. There are two types of switching on TReK: range and state code.
Transmission Control Protocol (TCP)	TCP is a connection-oriented protocol that guarantees delivery of data.
Telemetry	Transmission of data collected form a source in space to a ground support facility. Telemetry is downlink only.
Telescience Support Center (TSC)	A TSC is a NASA funded facility that provides the capability to plan and operate on-orbit facility class payloads and experiments, other payloads and experiments, and instruments.
User Application	Any end-user developed software program that uses the TReK Application Programming Interface software. Used synonymously with User Product.
User Data Summary Message (UDSM)	Packet type sent by PDSS that contains information on the number of packets sent during a given time frame for a PDSS Payload packet. For details on UDSM packets, see the POIC to Generic User IDD (SSP-50305).
Uplink format	The bit pattern of the command or file uplinked.

User Datagram Protocol (UDP)	UDP is a connection-less oriented protocol that does not guarantee delivery of data. In the TCP/IP protocol suite, the UDP provides the primary mechanism that application programs use to send datagrams to other application programs. In addition to the data sent, each UDP message contains both a destination port number and a fully qualified source and destination addresses making it possible for the UDP software on the destination to deliver the message to the correct recipient process and for the recipient process to send a reply.
User Product	Any end-user developed software program that uses the TReK Application Programming Interface software. Used synonymously with User Application.
Web	Term used to indicate access via HTTP protocol; also referred to as the World Wide Web (WWW).

Appendix B Acronyms

Note: This acronym list is global to all TReK documentation. Some acronyms listed may not be referenced within this document.

AOS	Acquisition of Signal
API	Application Programming Interface
APID	Application Process Identifier
ASCII	American Standard Code for Information Interchange
CAR	Command Acceptance Response
CAR1	First Command Acceptance Response
CAR2	Second Command Acceptance Response
CCSDS	Consultative Committee for Space Data Systems
CDB	Command Database
CDP	Custom Data Packet
COR	Communication Outage Recorder
COTS	Commercial-off-the-shelf
CRR	Command Reaction Response
DSM	Data Storage Manager
EHS	Enhanced Huntsville Operations Support Center (HOSC)
ERIS	EHS Remote Interface System
ERR	EHS Receipt Response
EXPRESS	Expediting the Process of Experiments to the Space Station
ES	Expected State
FAQ	Frequently Asked Question
FSV	Flight System Verifier
FSV1	First Flight System Verifier
FSV2	Second Flight System Verifier
FPD	Flight Projects Directorate
FTP	File Transfer Protocol
GMT	Greenwich Mean Time
GRT	Ground Receipt Time
GSE	Ground Support Equipment
HOSC	Huntsville Operations Support Center
ICD	Interface Control Document
IP	Internet Protocol
ISS	International Space Station
LDP	Logical Data Path
LES	Limit/Expected State
LOR	Line Outage Recorder
LOS	Loss of Signal
MCC-H	Mission Control Center – Houston
MOP	Mission, Operational Support Mode, and Project
MSFC	Marshall Space Flight Center
MSID	Measurement Stimulus Identifier
NASA	National Aeronautics and Space Administration

OCDB	Operational Command Database
OS	Operating System
PC	Personal Computer, also Polynomial Coefficient
PCDB	POIC Project Command Database
PDL	Payload Data Library
PDSS	Payload Data Services System
PGUIDD	POIC to Generic User Interface Definition Document
POIC	Payload Operations Integration Center
PP	Point Pair
PRCU	Payload Rack Checkout Unit
PSIV	Payload Software Integration and Verification
RPSM	Retrieval Processing Summary Message
SC	State Code
SCS	Suitcase Simulator
SSP	Space Station Program
SSCC	Space Station Control Center
SSPF	Space Station Processing Facility
TCP	Transmission Control Protocol
TReK	Telescience Resource Kit
TRR	TReK Receipt Response
TSC	Telescience Support Center
UDP	User Datagram Protocol
UDSM	User Data Summary Message
URL	Uniform Resource Locator
USOS	United States On-Orbit Segment
VCR	Video Cassette Recorder
VPN	Virtual Private Network